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THIRTY-SIXTH ANNUAL REPORT

ON THE

NEW YORK STATE MUSEUM OF NATURAL HISTORY,

Albany,

BY THE

REGENTS OF THE UNIVERSITY

OF THE

STATE OF NEW YORK.

TRANSMITTED TO THE LEGISLATURE JANUARY 12, 1883.

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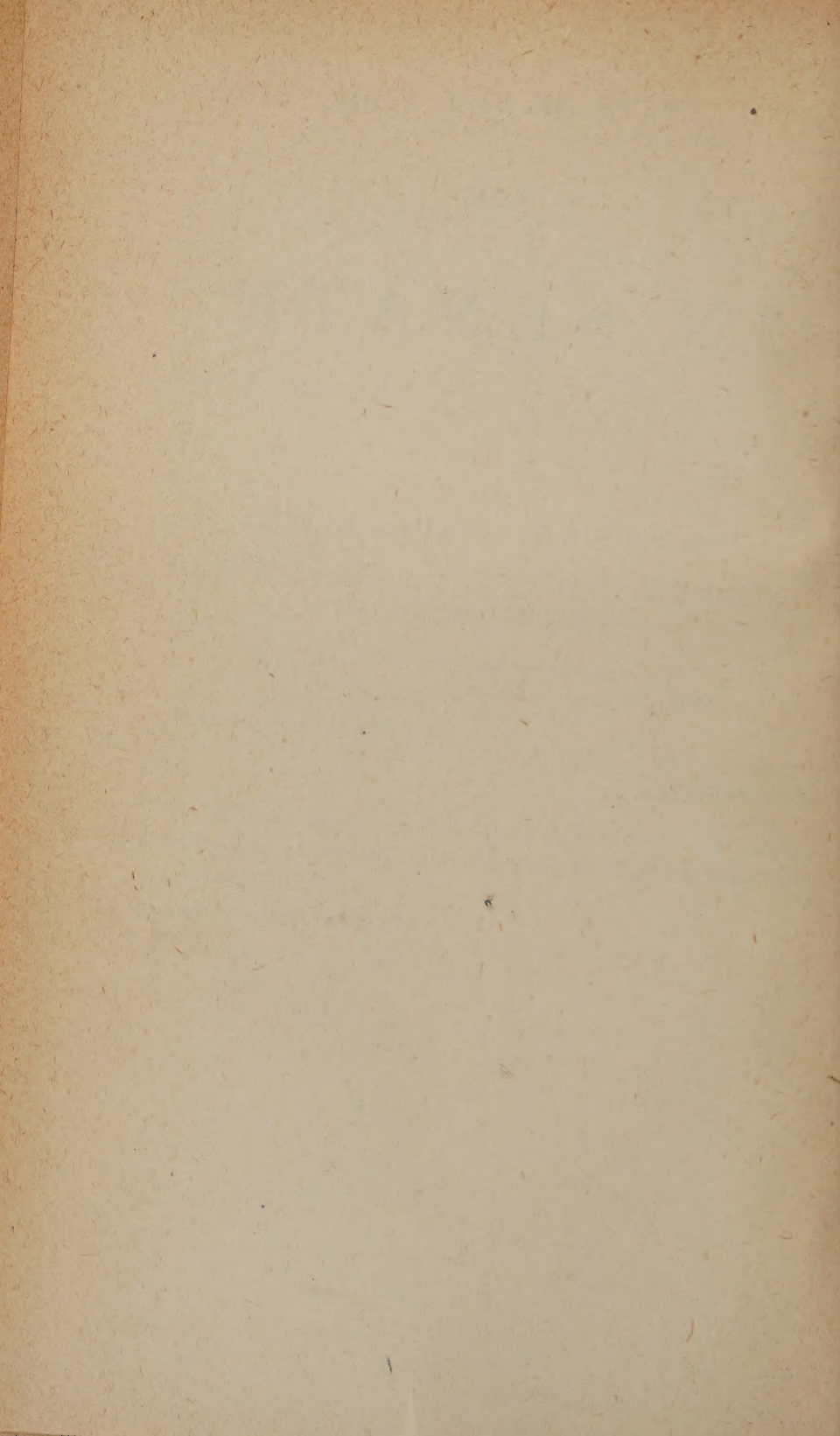
THIRTY-SIXTH ANNUAL REPORT
OF THE TRUSTEES OF THE STATE MUSEUM OF
NATURAL HISTORY.

UNIVERSITY OF THE STATE OF NEW YORK,
OFFICE OF THE REGENTS, TRUSTEES OF THE STATE
MUSEUM OF NATURAL HISTORY, }
ALBANY, *January 12, 1883.*

To the Legislature :

I have the honor to transmit the Thirty-sixth Annual Report of the Trustees of the State Museum of Natural History, as required by law.

H. R. PIERSON,
Chancellor of the University.



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REPORT.

To the Honorable the Legislature of the State of New York:

The Regents of the University, as Trustees of the State Museum of Natural History, in accordance with the provisions of law, respectfully submit their Thirty-sixth Annual Report.

For a full account of the operations of the Museum for the past year the Trustees beg to refer to the reports of the Director and the State Botanist, which are herewith transmitted.

Owing to the crowded condition of the Museum building the increase of the collections has been made a secondary matter during the past year. The labors of the assistants have been chiefly expended in preparing specimens for exhibition, and in other ways giving to the collections their greatest scientific value.

Whenever the State shall provide the much-needed additional room a great expansion in the number and variety of the specimens can at once be made.

More than 50,000 specimens belonging to the State now in charge of the State Geologist only await space to be transferred to the State Museum. The want of a fire-proof receptacle for these vast and invaluable collections is each year more plainly felt by the Trustees. During the last year one of the largest and most valuable collections in natural history in the country, that of Amherst College, was totally destroyed by fire, owing to the want of a fire-proof building.

The work of the scientific staff in the Museum has been prosecuted with great assiduity and success during the past year. The scientific papers of the members of the staff which have been published in the annual reports of the Legislature have been of great interest to scientific men, and applications for them are received from all parts of the world. It is earnestly recommended that the means to continue these publications may be afforded. In past years there has been much irregularity in the publication of the reports and much disappointment in consequence has been occasioned. There would be a great advantage in a plan by which the scientific reports of the Museum could be

printed under the direction of the Museum staff, instead of forming a part of the public printing. But as this would entail a considerable additional expense to the Museum it could only be done by an increase of the annual appropriation for its support.

The work of distributing collections of minerals among the academies of the State, under the authority of a concurrent resolution of the Legislature, has been carried out as fully as seemed to be called for. It has been the policy of the Trustees to give these collections only in cases where there was encouragement to believe that they would be a welcome and a useful addition to the educational equipments of the institution. The Trustees earnestly desire to see the Museum become a great center of educational influence for the State. With this view they seek to devise ways for aiding teachers of science in the institutions of learning throughout the State. They would gladly see the Museum used by them for study, and the staff of the Museum employed in aiding these students in fitting themselves for science teachers.

DAVID MURRAY,
Secretary.

Respectfully submitted,
H. R. PIERSON,
Chancellor of the University.

REPORT OF THE DIRECTOR.

ALBANY, December 23, 1882.

To the Honorable the Board of Regents of the University of the State of New York:

GENTLEMEN — I have the honor to communicate herewith the Annual Report upon the State Museum of Natural History, with some general account of the condition of the collections in the several departments, the additions which have been made thereto, and the work done in the institution during the past year.

The collections of the State Museum are all in good order and condition; and, so far as our facilities permit, are arranged for exhibition to the public. It is, however, impossible to extend these facilities very greatly for want of space in the building. Some additional table cases have been added during the past year, taking the place of a small working-room which had been separated from one of the public halls.

During the past month the collections of birds, mammals and skeletons have been removed and carefully cleaned and examined, and replaced in their cases in good order. That portion of the ethnological collection upon the same floor has likewise received careful attention and the perishable portions have been treated in the same manner as the stuffed skins of birds, etc., in order to insure their preservation.

All the alcoholic collections have likewise been examined and put in proper order. The small collections of Radiates and Echinoderms have been examined and rearranged in the cases, with additional specimens of corals obtained during the past year. The work of dusting and cleaning the conchological collection is now in progress, and this will be followed by the cleaning and rearrangement of the mineralogical collection.

It has been impossible to accomplish the proposed plan of presenting a systematic catalogue of the birds and mammals of the State, as intended; this work is, however, only deferred to a more favorable opportunity.

A catalogue of the Unionidæ of the several collections in the State
[Sen. Doc. No. 53.]

Museum was presented with the thirty-third report, but this is not yet printed. A catalogue of the land shells of the New York State collection, and of the land shells of the United States, in the State Museum, also of the Corbiculidæ of the New York State collections, were communicated at the same time, together with other important papers, which still remain in the hands of the State printer. It is already well known to your honorable board (though perhaps not so well known to the general public) that copies of these reports, beyond the usual document edition, are printed only by special order of the Legislature; and as no resolutions to this effect were passed for the printing of the thirty-second and thirty-third reports, they were, consequently, only published among the legislative documents. The same conditions have prevented the proper publication of the thirty-fourth report.

In consequence of this state of affairs, the appendices in part, and most of the scientific papers have been withdrawn, and were communicated with the thirty-fifth report. Two papers have been published in full or in abstract, through other channels. The thirty-fifth report is now in the hands of the State printer, and some progress has been made in the work.

This condition of the printing renders the working of the Museum extremely inconvenient and unsatisfactory; while it is very discouraging to all connected with the institution to have no printed evidence of work done during several preceding years. Another serious cause of delay and hindrance in every department of the work of the Museum is the unsettled and uncertain tenure by which we hold and occupy our working rooms. With the return of each successive Legislature the permanency of any existing plans or arrangement is threatened, and consequently it is impossible to carry out any systematic disposition of the material preparatory to working, or any final arrangement of that which has been studied and published, and which has become a part of the permanent collection of the Museum. Not only does this uncertainty hinder the progress of work, but often renders it necessary to do over again work which has been done in a temporary or tentative manner. The evil arising from all this is greater than can be expressed, and the final influences must reach beyond the present, for each succeeding year renders it more and more difficult to bring up the unfinished work of the past. It affects not only the actual collections, it affects every thing connected with the working of the institution, and modifies every report and its appended scientific papers. It affects in a greater or less degree every one connected with the work. There is a consciousness that the conditions which exist are unfavorable; and we cannot avoid the belief that a portion of the intel-

ligent public appreciate this state of affairs, and see the unfortunate influence on the results of the Museum work.

The additions to the Museum collections during the year 1882 will be found recorded in detail in the lists appended.

In the Botanical Department there have been nineteen contributors of an aggregate of 285 species.

In the Zoölogical Department there have been added to the arranged collections specimens from six sources.

The whale skeleton, purchased nearly two years since, has been in the custody of Professor Ward, of Rochester, for maceration and preparation. We had expected to have it delivered at the Museum about the end of this year, but I am just now informed that it will not be ready before March next.

The Museum Library has received the addition of 103 books and pamphlets by donation, and thirty publications by purchase and exchange.

To the collections in mineralogy, geology and palæontology, there have been added by donations from eleven contributors 72 specimens, besides the collections made by persons connected with the Museum, which are for the most part, from necessity, packed in boxes.

THE CURRENT WORK OF THE MUSEUM.

The accompanying report of the Botanist, Mr. C. H. Peck, will give an account of the work in his department, and the addition to the herbarium of 142 species of plants, of which 68 are new to this collection. On the second floor of the Museum, a collection of fungi is arranged for public inspection.

The Unionidæ and other fresh-water shells, with numerous sections of the same, referred to in a former report as the work of Mr. Geo. B. Simpson, has been in part arranged in cases, and the collection is in progress toward completion. A collection of Unionidæ and other fresh-water shells, made by Dr. D. N. DeTarr, assistant in the Museum during the summer of 1881, has been arranged by him in cases provided for that purpose.

A considerable part of the insect collection, which was made by Mr. Lintner for the State Museum, has been placed for exhibition in one of the large table-cases on the second floor. Although subject to deterioration from the influence of light, the Director has deemed it proper to place some portion of this collection where it can be seen by visitors to the Museum.

In the Department of Osteology, Anatomical and Alcoholic Specimens, and the preparation of translucent sections of fossils and min-

erals, under the charge of Dr. J. W. Hall, the work has been continued as heretofore; except that the general duties of the Museum (in the absence of an assistant in the Zoölogical Department, and the work heretofore performed by the taxidermist) have fallen upon the assistant who has charge of this department.

In addition to the above large translucent sections of rocks and fossils, nearly 300 sections of shells of Brachiopoda have been prepared by Mr. Beecher by hand for microscopic study. These sections, many of them minute, are mounted on glass slides of the standard size, and each one labeled with the generic and specific name. The study of the minute structure of the shells of brachiopoda is of much importance in determining the generic relations of this class of fossils, and has heretofore been too much neglected, from the difficulty of obtaining satisfactory specimens. This work was commenced by me several years since, in connection with the revision of the genera of the Brachiopoda, of which about thirty plates have already been prepared as a part of the palæontological work of the State.

The present collection has already furnished some important facts in regard to the classification of the Orthidæ and Strophomenidæ, and I propose to examine in this manner the shells of all the genera of Brachiopoda, which are known in the Palæozoic formations of New York.

Among the miscellaneous work of the Museum during the past year, a small geological map of New York (drawn with pen and the area of the formations indicated by different modes of lining) has been prepared to accompany the article on the History of the Geological Survey of New York, to be published in the "Civil Service of the State of New York." We have also prepared a large colored map, preparatory to the publication of a geological map of the State, embodying the results of geological investigation since 1844, which is the date of the last published geological map of the State.

During the past summer a single paper of fifty-nine pages, on the fossil corals of the Niagara and Upper Helderberg groups, has been published in advance of the Thirty-fifth Report of the State Museum.

COLLECTIONS IN THE FIELD.

Almost the only geological collections made in the field during the past year were from the Oriskany sandstone in the vicinity of Knox, in Albany county, and from the Mohawk valley. The latter were from the fresh exposures along the outcrops made by the excavations on the line of the West Shore railroad. These collections represent

the Laurentian, the Calciferous sandstone, the Trenton limestone and the Utica slate. A number of specimens from these collections will be available for the State Museum, and the remainder will go into the duplicate material for distribution. The interest in these collections is due to the fact that they illustrate the succession of beds, and the direct contact of the Calciferous sandstone with the Upper Laurentian gneiss, proving the absence of the Potsdam sandstone along the Mohawk valley.

A collection of specimens of the iron ores from Essex county has been made for the Museum.

COLLECTIONS ARRANGED IN THE TABLE-CASES OF THE MUSEUM.

A series of specimens from the Utica slate, illustrating the morphological development of *Triarthrus Becki*, has been labeled and arranged in the table-case of the palæontological series. This is the only series of the kind in the Museum, and is a very valuable addition to the collections of fossil Crustacea.

The largest addition to the arranged collections during the year is from the Niagara group of Waldron, Indiana. The specimens were selected from many thousand examples, and the whole arranged series represents a most complete exhibition of the Niagara fauna of Indiana. It is especially valuable for comparison with the same horizon in New York and elsewhere. This collection contains many typical specimens used in the illustration and descriptions of the species, and many very fine examples of other species. With the exception of the Schoharie collections, it is the largest and most complete representation of the fossils of a single locality in the State Museum.

A list of these additions is given elsewhere.

The specimens illustrated on the plates of *Lamellibranchiata*, in vol. v, part 1, *Palæontology of New York* (unpublished), have been numbered and arranged according to the plates, and a partial series selected for the Museum collections. The delay in the publication of this volume has been to the disadvantage of any final work in this series of fossils. The large collection of Devonian *Lamellibranchiata*, belonging to the State, cannot be made use of for the purposes of distribution, until the publication of this volume is completed.

A full set of the plates of the *Lamellibranchiata*, of vol. v, part 1, *Palæontology of New York* (as above), with manuscript descriptions of the figures, was sent to the Geological Survey of Kentucky, on application of Mr. Henry Nettelroth, who has in his charge the preparation of the report upon the fossil Mollusca of Kentucky.

The Director of the Museum, as State Geologist, has considered it a duty to furnish this information regarding unpublished work, from

the fact of the long delay in presenting our own publications for the use of scientific workers.

A pamphlet of more than sixty pages, containing descriptions of a part of these fossils, was published in 1869. The manuscript descriptions of the remaining species for the then proposed vol. v, part 1, have long been ready for the press, and were communicated with the Museum report two years since, but up to this time have not yet been printed.

The collections made in previous years from the Lower Carboniferous limestone of Spergen Hill, Indiana, and from the Lower Silurian on the shores of Lake Champlain, have been unpacked, cleaned and ticketed; and a large portion of these are repacked in boxes for want of space to arrange them. The remainder are now accessible for the selection of duplicates.

DISTRIBUTION OF DUPLICATE FOSSILS AND MINERALS.

Every year shows an increasing number of applications for labeled collections of fossils and minerals. Some of these are outside of the regulations adopted by the Board of Regents for the distribution of collections; but the Director has in many instances felt constrained to listen to such applications, believing that it would inure to the advantage of the Museum. In such cases he has made liberal use of his private collections of rocks and iron ores of Northern New York and other localities, from which the State Museum does not possess duplicates.

In addition to the general distribution above named, there have been sent, by authority of the Regents, a small collection of Oriskany sandstone fossils and a large stump of *Psaronius erianus*, to McGill College, Montreal, and presented to the Peter Redpath Museum.

In anticipation of the early removal, to some public building, of the large collections of fossils which have long been in the custody of the State Geologist, a large portion of the drawers containing them, about 1,200 in number, have been carefully examined and in part rearranged, the specimens cleaned, etc. The fossil corals, occupying about 500 close drawers, have been systematically arranged, and are in a cleanly and proper condition for removal at any time. The greater part of the collection is packed in boxes, and these are ready for removal as soon as a proper place shall be provided.

It is my melancholy duty to record the death of Mr. James A. Hurst, who has for more than thirty years acted as the taxidermist of the State Museum. Nearly all the stuffed specimens of birds and mammals have been mounted by him; and through his care and watchfulness they have remained in very excellent condition. I shall

consider it incumbent on me to communicate an obituary notice to the Regents for incorporation in the report, so soon as I shall be able to obtain the necessary data.

I am, very respectfully, your obedient servant,

JAMES HALL, *Director.*

ADDITIONS

TO THE COLLECTIONS OF THE STATE MUSEUM DURING THE YEAR 1882.

I. BOTANICAL.

From Mrs. L. A. MILLINGTON, Glens Falls, N. Y., specimens of young plants of *Epilobium molle*, Torr., bearing thickened subterranean scale-like leaves.

From Miss M. BOWLES, Columbia, Tenn., a specimen of *Polypodium incanum*, Pursh.

From C. D. HILL, Tunis, N. Y., a specimen of *Calystegia Sepium*, L., with pubescent stem and short flowers.

From J. F. SHOEMAKER, Luverne, Minn., specimens of *Oxybaphus nyctagineus*, Sweet.

From J. HOWELL, Arthur, Oregon, specimens of *Berberis Aquifolium*, Pursh; *Puccinia mirabilissima*, Pk., and *Dædalea vorax*, Harkness; also of wood of *Abies Douglasii*, injured by the *Dædalea*.

From S. B. GRISWOLD, Albany, N. Y., a dried flower of the Century plant, *Agave Americana*.

From CHARLES E. SMITH, Philadelphia, Pa., very fine specimens of both pistillate and staminate plants of *Corema Conradii*, Torr.

From C. F. CORNELIUS, Willow Brook, N. Y., a specimen of *Cynoglossum officinale*, L.

From Rev. WASHINGTON RODMAN, Astoria, N. Y., specimens of a new edible fungus, *Agaricus Rodmani*, Pk.

From H. N. JOHNSON, Coeymans, N. Y., fine specimens of *Sagittaria pusilla*, Nutt.; also specimens of a singular form of *Thalictrum anemonoides*, Mx.

From W. C. STEVENSON, Jr., Philadelphia, Pa., specimens of *Puccinia Myrrhis*, Schw.

From S. J. BOWMAN, Albany, N. Y., specimens of *Ranunculus multifidus*, Pursh.

From Hon. G. W. CLINTON, Albany, N. Y., specimens of *Eragrostis poaeoides*, Bv.; *E. Purshii*, Schrad.; *Tillæa simplex*, Nutt., and *Amarantus blitoides*, Wats.

From FELIX VON THUMEN, Vienna, Austria, specimens of one hundred and ninety-one species of fungi.

From W. RUSSELL, Albany, N. Y., per J. Gebhard, Jr., a fine specimen of the Chinese "leechee nut."

From E. L. HANKENSON, Newark, N. Y., specimens of *Sedum reflexum*, L.; *Azolla Caroliniana*, Willd., and hybrid *Salix cordata* x *sericea*.

From W. M. CANBY, Wilmington, Del., specimens of *Tillæa simplex*, Nutt.

From CLARENCE LOWN, Poughkeepsie, N. Y., specimens of the very rare ferns, *Cheilanthes vestita*, Sw.; *Asplenium Bradleyi*, D. C. Eaton, and *Asplenium ebenoides*, R. R. Scott; the last one new to the State.

From Prof. W. R. DUDLEY, Ithaca, N. Y., specimens of sixty-two species of plants, several of which are new to the Herbarium.

II. ZOOLOGICAL.

A specimen of *Macrosila quinquemaculata*, the tomato sphinx, from R. F. WELLER, Washington Valley, Kent Co., Rhode Island.

Thyræus abbotii, on grape vines, from J. VANDELOO, Albany, N. Y.

Specimen of *Blatta*, from W. R. ROSS, Greenbush, N. Y.

Large specimens of *Meandrina clivosa*, *Madrepora convexa* and *Favosites*, the latter polished; purchased from Mr. WOODMAN, New York city.

A pair of "dead-locked" elk horns, purchased of Mr. E. F. PHILBROOK, Des Moines, Iowa.

Collection of land and fresh-water shells from Georgia, purchased from Prof. R. E. CALL, David City, Nebraska.

III. GEOLOGICAL AND MINERALOGICAL.

Five samples of *Conularia crustula*, White, Upper Coal Measures, Kansas City, Mo.; by exchange from W. J. PARRISH, Kansas City, Mo.

A polished specimen of crystalline limestone, from G. E. WOODRUFF, Canton, St. Lawrence Co., N. Y.

Slab containing impression and fragment of *Lepidodendron*, from FRANK GOULD, Esq., Oneonta, N. Y.

Fragment of *Lepidodendron*, from MEIGS CASE, M. D., Oneonta, N. Y.

Two large specimens of Galena, from Galena, Ill., from DUNCAN CAMPBELL, Esq.

Numerous specimens of gypsum in florescent forms and calcite from Mammoth Cave, Ky., from HENRY RUSSELL, Esq., Albany.

Ten specimens of fossils from the Portage group, Perry, N. Y., in exchange from the PERRY UNION SCHOOL, J. P. Bishop, principal, Perry, Wyoming Co., N. Y.

Odontornithes (toothed birds). Casts of bones of *Hespiornis regalis*, twenty-six specimens, from Prof. O. C. MARSH, Yale College Museum, New Haven, Conn.

Ramphorhynchus phyllurus, Marsh (plaster cast), from the lithographic limestones, Jurassic formation of Bavaria: the original specimen is the only one yet found showing the membranes of the tail and wings; from Prof. O. C. MARSH, Yale College Museum, New Haven, Conn.

Two specimens of *Dicranograptus bicornis*, Kenwood, Albany, from JAMES F. FLANNERY, Albany.

Ten slabs of Trenton limestone with identified fossils from Dutchess and Orange counties; from Prof. W. B. DWIGHT, Vassar College, Poughkeepsie, N. Y.

Twelve specimens of graptolites from the Moffat Shales of Hartfell, Scotland, from JAMES DAIRON, Esq., of the Geological Society, Glasgow, Scotland.

IV. ETHNOLOGICAL, ETC.

A stone formerly marking a point in the boundary line between New York and Pennsylvania. For deposit in the historical collections of the Museum. From Dr. DAVID MURRAY, Secretary Board of Regents.

Several specimens of prepared flax brought from Albany by Col. Rochester in 1822, from MRS. GATES.

V. TO THE LIBRARY.

1. *By Donation.*

Report of the Commissioner of Agriculture for 1880.

Bulletin American Geographical Society, New York. 1881, Nos. 2, 3, 4, 5; 1882, No. 1.

Journal of the American Geographical Society, New York. Vols. XII, XIII. From the SOCIETY.

Geological Survey of Michigan, vol. IV.

Circulars from John Hopkins University, No. 13, February, 1882. Baltimore.

Population and Resources of Alaska.

Fourth Annual Report of the U. S. Geological Surveys. (King)

Bulletin of the United States Geological and Geographical Surveys, vol. VI, Nos. 2, 3.

Second Report, U. S. Entomological Commission on the Rocky Mountain Locust.

Beiträge zur Paläontologie von Oesterreich-Ungarn.

The Geological and Natural History Survey of Minnesota. Ninth annual report. From Prof. N. H. WINCHELL.

United States Entomological Commission, bulletin No. 7.

Anales del Museo Nacional de Mexico Tomo II.

Smithsonian Report, 1880.

Official Gazette U. S. Patent Office, vol. 21, Nos. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26; vol. 22, Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 and 26; errata, etc., vol. 21, January 3, to June 27, 1882.

Alphabetical list of patentees and inventors for the half year, January to June, 1882, inclusive; do. July to December, 1881, inclusive.

Memoirs of the Boston Society of Natural History, vol. 3, No. 5.

Circulars of Information of the Bureau of Education, No. 6, 1881, and No. 1, 1882.

Department of Agriculture, special report, Nos. 31, 42, 43, 44, 45, 46, 47; 48, 49, 52.

Library of Harvard University, bibliographical contributions, No. 13; Fossil Insects, by Samuel H. Scudder.

Official Gazette U. S. Patent Office, vol. XX, July 5, to December 27, 1881. (Index, etc.)

Carcenologiske Bidrag til Norges Fauna of G. O. Sars. Christiana, 1879.

Enumeratio Insectorum Norvigicorum Fasciculum, V. H. Siebke. Christiania, 1880.

Bidrag Nordenfjeldske Narges Insektfauna. John Sahlberg, Christiania, 1880.

Bidrag til Kundskaben om Norges Lepidopterfauna. J. Sparre Schneider, Christiania, 1881.

Ett försök att Bestämma en del af de Utaf. H. Strom beskrifna Narksa Insekter. H. D. J. Wallengren, Christiania, 1880.

Bemærkninger til H. Siebke's Enumeratio Insectorum Norvegicorum. Faseals v. Pars, 1 etc. W. M. Schoyen, Christiania, 1880.

Department of Agriculture—Florida, its Climate, Soil, Productions and Agricultural Capabilities. Washington, 1882.

Book list. Bernard Quaritch, June, 1882.

Studies from the Biological Laboratory John Hopkins University, Baltimore, vol. II, No. 3, June, 1882.

Fragments of the Coarser Anatomy of Diurnal Lepidoptera. S. H. Scudder, 1882.

Science Observer, vol. IV, Nos. 1, 2.

Bulletin of the Library Company of Philadelphia. July, 1882.

Sitzungsberichte und Abhandlungen, Jahrgang 1881. Dresden, 1882.

First Annual Report of the Bureau of Ethnology. J. W. Powell, 1879–1880.

United States Commission of Fish and Fisheries.—Commissioner's Report of 1879–1882.

Bulletin of the American Museum of Natural History, Central Park, New York, vol. 1, Nos. 2, 3.

Bacteria, by Chas. S. Dolley, M. D., Rochester, N. Y.

Zwölfter Bericht der Naturforschenden Gesellschaft in Bamberg, 1882.

Accessions to Indian Museum, Calcutta, 1881. Appendix A.

Auditor of Accounts, annual report, city of Boston, Mass., 1881, 1882.

American Museum of Natural History, 13th annual report. February 15, 1882.

Archives du Musée Teyler, Serie II, 2d Partie.

Sitzungsberichte und Abhandlungen der Naturwissenschaftlichen Gesellschaft, Isis in Dresden, 1822; Januar bis Juni.

Bulletin de L'Institut National Genevois. Tome XXIV, 1882.

R. Biblioteca Nazionale in Firenze Sezione di Scienze Fisiche e Naturale 1 Eccher (A), 2, 3 Tommasé (D), 4 Cavanna (G), 5 Mencci (F).

Annual Report of the Commissioner of Patents for the year 1881. Washington, 1882.

2. *By Purchase and Exchange.*

Journal of the Cincinnati Society of Natural History. July, 1882, vol. V, Nos. 2, 3.

American Journal of Science and Art, 3d series. Vol. XXIII, 133 to 138, inclusive; vol. XXIV, 139, 140, 141, 142, 143, 144.

American Naturalist, vol. XVI, 1 to 12 inclusive.

Encyclopædia Britannica, vols. XIII and XIV.

The Butterflies of North America, by W. H. Edwards. Second series, part X.

Proceedings of the Davenport Academy of Natural Sciences, vol. • III, part 2, 1882.

APPENDIX A.

LIST OF NIAGARA FOSSILS FROM WALDRON, INDIANA, ARRANGED IN
TABLE CASES IN THE STATE MUSEUM OF NATURAL HISTORY. SEP-
TEMBER, 1882:

Species.	Examples.
1. <i>Buthrotrephis gracilis</i> var. <i>crassa</i> , H. (typical).....	1
2. <i>Receptaculites subturbinatus</i> , Hall	2
3. " <i>sacculus</i> (type specimen).....	1
4. <i>Astylospongia præmorsa</i> , Goldf	8
5. <i>Deudrograptus</i> (s. g. <i>Chaunograptus</i>) <i>novellus</i> H. (type) ...	1
6. <i>Streptelasma</i> (<i>Duncanella</i>) <i>boreale</i> , Nich.....	16
7. <i>Aulopora præcius</i> , Hall.....	2
8. <i>Streptelasma radicans</i> , Hall.....	12
9. <i>Zaphrentis celator</i> , Hall	2
10. <i>Favosites Forbesi</i> , var. <i>occidentalis</i> , Hall.....	11
11. " " " " " " (slab)	1
12. " " " " " " (bases)	2
13. " " " " " " (small cells).....	2
14. " " " " " " (typical) incipient growth of a colony on <i>Meristella nitida</i>	1
15. <i>Favosites Forbesi</i> var. <i>occidentalis</i> , Hall (typical), cell-tubes elongate and a very extended epitheca.....	1
16. <i>Favosites Forbesi</i> var. <i>occidentalis</i> , Hall (typical), pyriform specimen	1
17. <i>Favosites Forbesi</i> var. <i>occidentalis</i> , Hall, attached to crin- oid stems.....	2
18. <i>Favosites Forbesi</i> var. <i>occidentalis</i> , Hall, double carallum...	1
19. " " " " " " epitheca decorticated,	1
20. " " " " " " (typical), showing opercula to the cells.....	1
21. <i>Favosites Forbesi</i> var. <i>occidentalis</i> , Hall, with cell-tubes ex- posed.....	1
22. <i>Favosites Forbesi</i> var. <i>occidentalis</i> , Hall, longitudinal section,	1
23. " " " " " " transverse section...	1
24. <i>Lichenalia concentrica</i> , Hall, large specimen (typical)	1
25. " " " "	4
26. " " " " poriferous side	5
28. " " " " var. <i>maculata</i> , poriferous side..	1
29. <i>Saccocrinus Christyi</i> , Hall (two figured specimens, typical).	7
30. <i>Lyriocrinus Melissa</i> , Hall (one type specimen).....	8

Species.	Examples.
31. <i>Eucalyptocrinus crassus</i> , Hall, series from young to mature individuals.....	20
31. <i>Eucalyptocrinus crassus</i> , Hall, arms, calyx and a portion of the column	1
32. <i>Eucalyptocrinus crassus</i> , Hall, elongate forms of calices....	2
33. " " " three heads lying bedded in the shale parallel and side by side.....	1
34. <i>Eucalyptocrinus ovalis</i> , Troost., showing variation in size..	5
35. " " constrictus, Hall (type).....	1
36. Roots of <i>Eucalyptocrinus</i>	1
37. " " "	1
38. <i>Eucalyptocrinus cælatus</i> , Hall, series showing variation in size and form.....	13
39. <i>Eucalyptocrinus cælatus</i> — typical, a very fine specimen consisting of the body with the arms and a portion of the column. The column and roots have been extended and restored from other individuals so that the entire size and appearance of a perfect specimen is produced.....	1
(Placed in a wall-case on account of the size of the specimen.)	
40. Niagara shale, with <i>Eucalyptocrinus cælatus</i> (3), <i>Eucalyptocrinus ovalis</i> (1), <i>Eucalyptocrinus crassus</i> (1), <i>Eucalyptocrinus column</i> , with attached <i>Favosites</i> (1), <i>Spirifera radiata</i> (3), <i>Rynchonella Indianensis</i> (2), <i>Spirifera crispa</i> var. (1), <i>Rhynchotrete cuneata</i> (1), <i>Streptelasma</i> (<i>Duncanella</i>) <i>boreale</i> (1), <i>Favosites Forbesi</i> , var. <i>occidentalis</i> (1), <i>Trematopora echinata</i> (1), <i>Trematopora osculum</i> (1).....	1
41. <i>Lecanocrinus pusillus</i> , Hall (1 type specimen), and series showing form and variation.....	7
42. <i>Ichthyocrinus subangularis</i> , Hall (2 type specimens).....	3
43. <i>Poteriocrinus</i> ? calyx, Hall (type)	1
44. <i>Dendocrinus ancilla</i> , Hall (type)	1
45. <i>Macroslyptocrinus striatus</i> , Hall	6
46. " " var. <i>granulosus</i> (types of var.)....	5
47. " " <i>fasciatus</i> , Hall (typical).....	4
48. <i>Cyathocrinus Polyxo</i> , Hall.....	5
49. <i>Stephanocrinus gemmiformis</i> , Hall	5
50. <i>Codaster</i> (<i>Stephanocrinus</i> ?) <i>pulchellus</i> , Miller & Dyer (typical).....	6
51. <i>Codaster pentalobus</i> , Hall (type).....	1
52. Slab with <i>Eucalyptocrinus crassus</i> , <i>Lyriocrinus Melissa</i> , <i>Favosites Forbesi</i> , var. <i>occidentalis</i>	1
53. Shale, with <i>Saccorinus Cristyi</i> , bearing the impressions of segments of a crinoid column, <i>Eucalyptocrinus crassus</i> , Hall	1
54. <i>Cyathocrinus nucleus</i> , Hall (typical).....	4
55. <i>Glyptocrinus Carleyi</i> , Hall (typical)	3
56. <i>Eucalyptocrinus crassus</i> , longitudinal section.....	2
57. " " transverse sections.....	4
58. <i>Ampheristocrinus typus</i> , Hall (types).....	3
59. <i>Pterinea brisa</i> , Hall, typical	3
60. <i>Ambonychia acutirostra</i> , Hall.....	3

Species.	Examples.
61. <i>Goniophora speciosa</i> , Hall, type.....	1
62. <i>Conularia infrequens</i> , type.....	1
63. <i>Strophostylus cyclostomus</i> , Hall, a series from small to large individuals.....	12
64. <i>Strophostylus cyclostomus</i> , Hall, showing columella.....	2
65. " " " var. with elevated spire....	4
66. <i>Platystoma Niagarense</i> , Hall, a series showing gradation in size	10
67. <i>Platystoma Niagarense</i> , Hall, showing form of aperture....	2
68. " " " var. with last volution free for a portion of its extent.....	2
69. Two slabs containing <i>Platystoma Niagarense</i>	2
70. <i>Platystoma plebeium</i> , Hall	1
71. <i>Cyrtolites sinuosus</i> , Hall	1
72. <i>Orthoceras annulatum</i> , Sow., typical.....	1
73. " " "	1
74. " " " typical longitudinal section.....	1
75. " " " bedded in shale.....	1
76. " " " compressed specimen.....	1
77. " " " small specimen.....	1
78. " " medullare, Hall, longitudinal section.....	1
79. " " simulator, Hall, typical.....	1
80. " " "	4
81. <i>Trochoceras Waldrenense</i> , Hall	2
82. <i>Orthoceras Amycus</i> , Hall (type).....	1
83. <i>Nautilus Oceanus</i>	1
84. <i>Crania Siluriana</i> , Hall; three specimens on <i>Eucalytocrinus crassus</i> , one specimen on <i>Platystoma Niagarense</i> , two specimens on <i>Meristina Maria</i>	4
85. <i>Strophomena rhomboidalis</i> , Wilc., seven specimens showing exterior form, three specimens showing muscular markings on interior of valves.....	10
86. <i>Strophodonta striata</i> , Hall.....	5
87. <i>Meristina Maria</i> , Hall, series showing gradation in form and size.....	11
88. <i>Meristina nitida</i> , a series showing gradation in form and size,	18
89. <i>Strophodonta profunda</i> (typical).....	1
90. <i>Streptorhynchus tenuis</i> , Hall.....	1
91. <i>Rhynchonella Stricklandi</i> , in series	15
92. " " <i>Whitii</i> , in series.....	21
93. " " <i>acinus</i> , in series.....	16
94. " " <i>neglecta</i> , in series, 1 type of var.....	19
95. " " <i>Indianensis</i> , in series, 3 types of var.....	18
96. <i>Meristella rectirostra</i> , Hall (types).....	12
97. <i>Leptaena transversalis</i> , Wahl	2
98. <i>Rhynchonella Stricklandi</i> with <i>Favosites Forbesi</i> , var. <i>occidentalis</i> , Hall.....	1
99. <i>Spirifera radiata</i> with <i>Platystoma Niagarense</i>	1
100. <i>Spirifera radiata</i> , Sowerby, in series.....	12
101. " " <i>eudora</i> , Hall.....	2
102. " " <i>crispa</i> , Hisinger, in series.....	19
103. " " " var. <i>simplex</i> , in series.....	9

Species	Examples.
104. <i>Pentamerus fornicatus</i> var. H. Type of var.....	1
105. <i>Anastrophia internascens</i> , Hall, in series.....	15
106. <i>Rhynchotretra cuneata</i> var. <i>Americana</i> , Hall, types of var. in series.....	17
107. Small shells washed from the soft shales.....	+50
108. <i>Eichwaldia reticulata</i> , Hall.....	15
109. <i>Chonetes Nova-Scotica</i> , Hall.....	1
110. Slab with <i>Rhynchonella Whitii</i> , <i>Rhynchonella Indianensis</i> , <i>Platystoma Niagarensis</i>	1
111. <i>Cornulites proprius</i> , Hall, on <i>Spirifera radiata</i>	1
112. " " " on <i>Trematopora osculum</i>	1
113. " " " on <i>Rhynchonella Stricklandi</i> , a type.....	1
114. <i>Cornulites proprius</i> , Hall, on various objects, 1 type specimen on <i>trematopora</i>	6
115. <i>Cornulites proprius</i> , Hall, on <i>Platystoma Niagarensis</i> , a type.....	1
116. " " " apices on <i>gasteropods</i>	3
117. " " " " " <i>Meristina</i>	3
118. " " " " " separate tubes.....	3
119. <i>Dalmanites verrucosus</i> , Hall, series of heads ..	7
120. " " " tails.....	3
121. Slab with <i>Dalmanites verrucosus</i> (tail), <i>Strophodonta striata</i> , <i>Trematopora osculum</i>	1
122. <i>Lichas breviceps</i> , Hall, thorax and tail.....	1
123. " " " tail.....	1
124. " " " glabellas.....	2
125. Slab with <i>Dalmanites vigilans</i> (heads) five, <i>Dalmanites vigilans</i> with <i>cornulites</i> , one; <i>Lichas breviceps</i> (head), one; <i>Cyphaspis Christyi</i> (heads), two; <i>Streptorhynchus subplana</i> , one; <i>Lichenalia concentrica</i> , one, <i>Trematopora spiculata</i> , one; <i>Trematopora subimbricata</i> , one; <i>Trematopora echinata</i> , two.....	1
126. <i>Calymene Niagarensis</i> , Hall.....	6
127. <i>Cyphaspis Christyi</i> , Hall.....	1
128. " " " enrolled.....	3
129. " " " and hypostoma of <i>Lichas Boltoni</i> var <i>occidentalis</i>	1
130. <i>Dalmanites vigilans</i> , Hall, entire specimen typical.....	1
131. " " " head.....	1
132. " " <i>bicornis</i> , Hall, frontal margin.....	1
133. " " <i>verrucosus</i> , Hall, frontal margin.....	2
134. <i>Homalonotus delphinocephalus</i> , Green.....	1
135. <i>Illæus</i> (<i>Bumastus</i>) <i>Ioxus</i> , Hall (typical) glabella.....	1
136. " " " " " tail.....	1
137. " " <i>armatus</i> , Hall (1 typical) 2 glabellas, 1 pygidium..	3
138. <i>Lichas Boltoni</i> (<i>Bigsby</i>) var. <i>occidentalis</i> , Hall, glabella and hypostoma.....	1

+620

Making altogether eighty-two species which are represented in more than six hundred and twenty examples.

The Bryozoans not arranged in the cases at the Museum occupy fifteen drawers. This collection includes the type specimens of all the new species described in volume X of the *Transactions of the Albany Institute*, and also the specimens used in describing the species figured in the documentary edition of the Twenty-eighth Report.

The following list includes specimens mostly from other classes which have been selected and prepared for the collections, but for which there is no space to arrange them in the cases at the Museum :

Fucoids.....	1
Sponges.....	14
Favosites spinigerus.....	14
" Forbesi, var. occidentalis.....	1
Streptelasma.....	3
Chætetes.....	3
Lichenalia.....	5
Ceramopora.....	3
Slabs of Brachiopoda.....	26
Orthis hybrida.....	16
" " var.....	12
" elegantula.....	24
Nucleospira pisiformis.....	14
Crania setigera.....	10
Miscellaneous.....	10
Alrypa reticularis.....	25
Retzia evax.....	25
Orthis biloba.....	10
Triplesia putillus (types).....	2
Pholidops ovalis.....	11
Zygospira minima (type).....	1
Lingula gibbosa (types).....	2
Cœlospira disparilis.....	16
Streptorhynchus subplana.....	18
Strophodonta striata.....	7
Chonetes.....	10
Spirifera bicostata var. petita (types of var.).....	6
Lamellibranchiata (1 type).....	16
Gasteropoda.....	4
Cornulites.....	10
Coleolus spinulus, type.....	1
Crustacea, several typical specimens.....	31
Crinoidea.....	38

399

The entire collection is represented in more than 1,019 examples.

APPENDIX B.

LIST OF GENERA AND SPECIES OF BRACHIOPODA, OF WHICH SECTIONS HAVE BEEN PREPARED FOR THE MICROSCOPE.

<i>Orthis testudinaria.</i>	<i>Rensselæria ovalis.</i>
“ <i>Vanuexemi.</i>	<i>Atrypa aspera.</i>
“ <i>biforata.</i>	<i>Pentamerella arata.</i>
“ <i>Iowensis.</i>	<i>Crania Hamiltoniæ.</i>
“ <i>borealis.</i>	<i>Eichwaldia reticulata.</i>
“ <i>perveta.</i>	<i>Productus subulatus.</i>
“ ? <i>Strophomenoides.</i>	<i>Retzia evax.</i>
“ <i>Penelope.</i>	<i>Spirigera Roysii</i>
“ <i>elegantula.</i>	<i>Leptocoelia concava.</i>
“ <i>tricenaria.</i>	“ <i>imbricata.</i>
“ <i>occidentalis.</i>	<i>Vitulina pustulosa.</i>
“ <i>Tulliensis.</i>	<i>Spirifera laevis.</i>
“ <i>Clytie.</i>	“ <i>zigzag.</i>
“ <i>plicatella.</i>	“ <i>fimbriata.</i>
“ <i>hybrida.</i>	“ <i>mucronata.</i>
“ <i>impressa.</i>	“ <i>Hungerfordi.</i>
“ <i>flabella.</i>	<i>Spiriferina spinosa.</i>
“ <i>subquadrata.</i>	<i>Syringothyris textus.</i>
“ <i>concinna.</i>	<i>Cyrtina Hamiltonensis.</i>
<i>Strophodonta magnifica.</i>	<i>Orthyris spiriferoides.</i>
“ <i>concava.</i>	<i>Camarella congesta.</i>
“ <i>demissa.</i>	<i>Trematospira nobilis.</i>
“ <i>arcuata.</i>	“ <i>camura.</i>
“ <i>perplana.</i>	<i>Stricklandinia.</i>
“ <i>reversa.</i>	<i>Meristina maria.</i>
“ <i>nacra.</i>	<i>Leptaena sericea.</i>
“ <i>striata.</i>	<i>Nucleospira pisiformis.</i>
<i>Strophomena alternata.</i>	<i>Lingulepis pinnaeformis.</i>
“ <i>rhomboidalis.</i>	<i>Rhynchonella capax.</i>
<i>Strophonella semifasciata.</i>	<i>Anastrophia internascens.</i>
<i>Chonetes coronata.</i>	<i>Zygospira modesta.</i>
<i>Streptorhynchus hipparionyx.</i>	<i>Ambocoelia umbonata.</i>
“ <i>subplana.</i>	“ <i>præumbona.</i>
“ <i>crenistris.</i>	<i>Rhynchotrete cuneata.</i>
<i>Tropidoleptus carinatus.</i>	

REPORT OF THE BOTANIST,

CHARLES H. PECK.

REPORT OF THE BOTANIST.

Hon. DAVID MURRAY, LL. D.,

Secretary of the Board of Regents of the University :

SIR — Since the date of my last report, specimens of one hundred and forty-two species of plants have been mounted and placed in the State Herbarium, of which sixty-eight were not previously represented therein. The specimens of the remaining species represent new forms or varieties of species before represented, or exhibit some features or characters not well shown by the older specimens. A list of the species of which specimens have been mounted is hereinafter given and marked (1).

By reason of the veto, by the Governor, of the appropriation for the reimbursement of the expenses of the Botanist for the years 1880 and 1881, it was not deemed prudent by me to advance any more money to meet these expenses. I have, therefore, been obliged to devote myself to the accomplishment of such work as could be done with the materials already on hand, and I have no additions to the Herbarium by the collecting of the Botanist, to report. This interruption of the work is to be regretted since it delays its completion and thereby increases the cost. If it shall be deemed best to continue the work of supplying deficiencies in the Herbarium and of developing a knowledge of the cryptogamic botany of our State, it is desirable that either the salary of the Botanist be increased sufficiently to enable him to meet the necessary expenses out of his own pocket, or else that an appropriation for these expenses be made in advance.

As usual, numerous specimens have been contributed to the Herbarium by various correspondents and other co-laborers in botany. A list of the contributors and of their respective contributions is marked (2).

Some of the contributed specimens represent plants that are new to the Herbarium and have not before been reported, others are rare plants from newly-discovered localities, or specimens that exhibit some

peculiar variation in the species, and for these or other reasons are worthy of notice. New stations of rare plants, remarks and observations are recorded in a section marked (3).

Among the contributed specimens is a new species of edible fungus belonging to the genus *Agaricus*, subgenus *Psalliota*, and closely related to the common edible mushroom, and its near relative the horse mushroom. The mushrooms are so interesting by reason of their frequent use as an article of food, and the three species mentioned are so variable and so intimately related to each other, that in pursuance of a plan already adopted in two previous reports (in which synopses of the subgenera *Amanita* and *Lepiota* have been given), I have thought best to give a full descriptive synopsis of all our New York species of the subgenus *Psalliota*. In this monograph the descriptions have been revised and made more complete, the dimensions of the spores have been given and copious remarks have been added with the design of pointing out more clearly the distinguishing features of the species and of aiding in their discrimination. It is marked (4).

(1.)

PLANTS MOUNTED.

Not new to the Herbarium.

- | | |
|-------------------------------------|---|
| Ranunculus abortivus, <i>L.</i> | Potamogeton crispus, <i>L.</i> |
| Raphanus Raphanistrum, <i>L.</i> | P. pusillus, <i>L.</i> |
| Brassica Sinapistrum, <i>Boiss.</i> | P. pectinatus, <i>L.</i> |
| Viola Selkirkii, <i>Pursh.</i> | P. gramineus, <i>L.</i> |
| Geranium maculatum, <i>L.</i> | Smilax hispida, <i>Muhl.</i> |
| Acer rubrum, <i>L.</i> | Trillium grandiflorum, <i>Satish.</i> |
| Trifolium repens, <i>L.</i> | Polygonatum giganteum, <i>Diet.</i> |
| Rubus triflorus, <i>Rich.</i> | Uvularia sessilifolia, <i>L.</i> |
| Opuntia Rafinesquii, <i>Engelm.</i> | Heteronthera reniformis, <i>R. and P.</i> |
| Tiarella cordifolia, <i>L.</i> | Eleocharis tuberculosa, <i>R. Br.</i> |
| Mitchella repens, <i>L.</i> | Scleria pauciflora, <i>Muhl.</i> |
| Viburnum nudum, <i>L.</i> | Carex stricta, <i>Lam.</i> |
| Heracleum lanatum, <i>Mr.</i> | C. " Muhlenbergii, <i>Schk.</i> |
| Tanacetum vulgare, <i>L.</i> | C. cephalophora, <i>Muhl.</i> |
| Vaccinium corymbosum, <i>L.</i> | C. Emmonsii, <i>Dew.</i> |
| V. Pennsylvanicum, <i>Lam.</i> | C. Pennsylvanica, <i>Lam.</i> |
| Nyssa multiflora, <i>Wang.</i> | C. tenera, <i>Dew.</i> |
| Scutellare galericulata, <i>L.</i> | C. lagopodioides, <i>Schk.</i> |
| Marrubium vulgare, <i>L.</i> | C. adusta, <i>Boott.</i> |
| Apocynum cannabinum, <i>L.</i> | C. granularis, <i>Muhl.</i> |
| Polygonum orientale, <i>L.</i> | C. gracillima, <i>Schw.</i> |
| Fraxinus Americana, <i>L.</i> | C. cristata, <i>Schw.</i> |
| F. pubescens, <i>Lam.</i> | C. mirabilis, <i>Dew.</i> |
| Quercus alba, <i>L.</i> | C. virescens, <i>Muhl.</i> |
| Q. Prinus, <i>L.</i> | C. vulpinoidea, <i>Mr.</i> |
| Q. rubra, <i>L.</i> | C. plantaginea, <i>Lam.</i> |
| Q. coccinea, <i>Wang.</i> | C. laxiflora, <i>Lam.</i> |
| Q. tinctoria, <i>Bart.</i> | Zizania aquatica, <i>L.</i> |
| Populus tremuloides, <i>Mr.</i> | Stipa avenacea, <i>L.</i> |
| P. grandidentata, <i>Mr.</i> | Aira flexuosa, <i>L.</i> |

Bromus racemosus, *L.*
Poa trivialis, *L.*
Eragrostis pilosa, *Bo.*
Aspidium Boottii, *Tuckerm.*
Osmunda cinnamomea, *L.*
Agaricus serotinus, *Schrad.*
A. æruginosus, *Curt.*

Agaricus sapidus, *Kalchb.*
Polyporus adustus, *Willd.*
P. hispidioides, *Pk.*
Trametes mollis, *Sommf.*
Corticium læve, *Pers.*
C. incarnatum, *Pers.*
C. lilacinofuscum, *B. and C.*

New to the Herbarium.

Malva crispa, *L.*
Tillæa simplex, *Nutt.*
Sedum acre, *L.*
Amarantus blitoides, *Wats.*
Sagittaria pusilla, *Nutt.*
Eragrostis Purshii, *Schrad.*
Agaricus alluviinus, *Pk.*
A. rubrotinctus, *Pk.*
A. albus, *Schæff.*
A. pascuus, *Pers.*
A. sinuatus, *Fr.*
A. fastibilis, *Fr.*
A. sulcatipes, *Pk.*
A. hærens, *Pk.*
A. tiliophilus, *Pk.*
A. nitidipes, *Pk.*
A. epimyces, *Pk.*
Hygrophorus fuliginosus, *Frost.*
H. flavodiscus, *Frost.*
Marasmius salignus, *Pk.*
Polyporus immitis, *Pk.*
P. fraxinophilus, *Pk.*
Irpex crassus, *B. and C.*
I. mollis, *B. and C.*
Corticium effuscatum, *C. and E.*
Thelephora rosella, *Pk.*
Cyphella læta, *Fr.*
Phoma cucurbitale, *B. and C.*
Sphaeropsis Caryæ, *C. and E.*
Discella hysteriella, *Pk.*
D. albomaculans, *Pk.*
Glæosporium fraxinea, *Pk.*
Septoria cannabina, *Pk.*
S. Sicyi, *Pk.*

Septoria Cirsii, *Niessl.*
S. Calystegiae, *Sacc.*
S. musiva, *Pk.*
Phyllosticta Cratægi, *Pk.*
P. variabilis, *Pk.*
Protomyces macrosporus, *Ung.*
Ustilago pallida, *Schrad.*
Acalyptospora Populi, *Pk.*
Macrosporium transversum, *Pk.*
Alternaria tenuis, *Nees.*
Ellisiella caudata, *Sacc.*
Botrytis ceratioides, *Pk.*
Dactylium dendroides, *Fr.*
Verticillium Lactarii, *Pk.*
Cercospora Tiliæ, *Pk.*
C. Lepidii, *Pk.*
C. Daturæ, *Pk.*
C. varia, *Pk.*
C. longispora, *Pk.*
Ramularia Vaccinii, *Pk.*
R. Ranunculi, *Pk.*
R. Hamamelidis, *Pk.*
R. aquatilis, *Pk.*
Asterophora Pezizæ, *Cd.*
Peziza lætiruba, *Cke.*
P. singularia, *Pk.*
Tympanis Nemopanthidis, *Pk.*
Cenangium betulinum, *Pk.*
Triblidium clavosporum, *Pk.*
Ascomyces deformans, *Berk.*
Gymnascella aurantiaca, *Pk.*
Valsa tomentella, *Pk.*
Sphærella fraxinea, *Pk.*
Venturia curviseta, *Pk.*

(2.)

CONTRIBUTORS AND THEIR CONTRIBUTIONS.

Mrs. L. A. Millington, Glens Falls N. Y.

Epilobium molle, *Torr.*

Miss M. Bowles Columbia, Tenn.

Polypodium incanum, *Pursh.*

C. D. Hill, Tunis, N. Y.

Calystegia Sepium, *L.*

J. F. Shoemaker, Luverne, Minn.

Oxybaphus nyctagineus, *Sweet.*

[Sen. Doc. No. 53.] 5

Charles E. Smith, Philadelphia, Penn.

Corema Conradii, Torr.

U. F. Cornelius, Willow Brook, N. Y.

Cynoglossum officinale, L.

Rev. Washington Rodman, Astoria, N. Y.

Agaricus Rodmani, Pk.

H. N. Johnson, Coeymans, N. Y.

Sagittaria pusilla, Nutt.

Thalictrum anemonoides, Mx.

W. C. Stevenson, Jr., Philadelphia, Pa.

Puccinia Myrrhis, Schw.

S. J. Bowman, Albany, N. Y.

Ranunculus multifidus, Pursh.

Hon. G. W. Clinton, Albany, N. Y.

Tillæa simplex, Nutt.

Eragrostis poæoides, Br.

Amarantus blitoides, Wats.

E. Purshii, Schrad.

J. Howell, Arthur, Oregon.

Puccinia mirabilissima, Pk.

Berberis Aquifolium, Pursh.

Dædalea vorax, Hark.

Wood of Abies Douglassii.

S. B. Griswold, Albany, N. Y.

A flower of the Century plant, Agave Americana, L.

W. M. Canby, Wilmington, Del.

Tillæa simplex, Nutt.

W. Russell, Albany, N. Y.

A specimen of the Chinese "leechee nut."

E. L. Hankenson, Newark, N. Y.

Sedum reflexum, L.

Salix cordata sericea.

Azolla Caroliniana, Willd.

Felix von Thumen, Vienna, Austria.

Agaricus geophyllus, Sow.

Stereum sanguinolentum, Fr.

A. mitis, Fr.

Corticium roseum, Fr.

A. sphinctrinus, Fr.

C. radiosum, Fr.

Polyporus cinnabarinus, Jacq.

C. Juniperina, Karst.

P. pergamenus, Fr.

Hirneola Auricula-Judæ, Berk.

P. cuticularis, Fr.

Clavaria fistulosa, Fr.

Merulius molluscus, Fr.

C. Kunzei, Fr.

Dædalea mollis, Sommf.

C. cristata, Holmsk.

Craterellus sinuosus, Fr.

Pistillaria quisquiliaris, Fr.

C. cornucopioides, Fr.

Typhula filiformis, Fr.

Thelephora sebacea, Pers.

Tremella disciformis, Fr.

T. fastidiosa, Fr.

Geaster triplex, Jungh.

Stereum lobatum, Kze.

Mycogala parietinum, Rost.

- Æcidium Lampsanæ, Schultz.*
Æ. Thalictri, Grev.
Æ. Pastinacæ, Rost.
Æ. Onosmatis, Thum.
Æ. Lithospermi, Thum.
Æ. Symphyti, Thum.
Æ. Ligustri, Strauss.
Æ. Orchidearum, Desm.
Æ. Xylostei, Wallr.
Æ. Frangulæ, Schum.
Æ. Tussilaginis, Pers.
Puccinia Oxyriæ, Fekl.
P. Asteris, Schw.
P. Anemones, Pers.
P. Wilcoxiana, Thum.
P. crassivertex, Thum.
P. Artemisiarum, Duby.
P. Brachypodii, Fekl.
P. Morthierii, Kornick.
P. Cirsii, Lasch.
Urocystis primulicola, Magn.
Synchytrium Taraxaci, DeBy.
Ceratitium Oxyacanthæ, Desm.
C. laceratum, Sov.
Uredo cancellata, D. and M.
U. alpestris, Schroet.
U. Iridis, Duby.
U. digitariæcola, Thum.
Coleosporium ochraceum, Bon.
C. Campanulacearum, Fr.
Uromyces Cacaliæ, Lev.
U. Lathyri, Fekl.
U. Iridis, Lev.
Cronartium ribicola, Dietr.
Melampsora Euphorbiæ, Castr.
M. Balsamiferæ, Thum.
M. Lini, Tul.
Podosphaeria biuncinata, C. and P.
P. Kunzei, Lev.
Uncinula flexuosa, Pk.
U. macrospora, Pk.
U. circinata, C. and P.
Calocladia penicillata, Lev.
Microsphaeria Viburni, Schw.
Erysiphe Martii, Lev.
E. lamprocarpa, Lev.
Phyllactinia guttata, Lev.
Sphaerotheca Castagnei, Lev.
S. Niesslii, Thum.
Stigmathea Chætodium, Fr.
S. confertissima, Fekl.
Capnodium pelliculosum, B. and Br.
Ceratostoma spurium, Fr.
Massaria fœdans, Fr.
M. inquinans, Tul.
Epichloe typhina, Tul.
Cryptospora nigro-annulata, Rehm.
Phyllachora Ulmi, Fekl.
Ascomyces Quercus, Uke.
A. cærulescens, Mu.
A. alutaceus, Thum.
Excascus Alni, Fekl.
E. Betulæ, Fekl.
Botryosphaeria Berengeriana, DeNott.
- Calosphaeria tumidula, Sacc.*
Anthostomella Yuccæ, Thum.
Zignoella punctiformis, Sacc.
Roesleria hypogaea, P. and T.
Gibberella pulicaris, Sacc.
Coleroa Alchemillæ, Fr.
Ombrophila Mortheriana, Rehm.
Bulgaria inquinans, Fr.
Durella macrospora, Fekl.
Mollisia excelsior, Karst.
Helotium scutula, Karst.
H. stigmation, Rehm.
Peziza striata, Nees.
P. flavofuliginea, A. and S.
P. carpinea, Fr.
Hypoderma Lauri, Duby.
Lophium decipiens, Karst.
Lophodermium petiolicolum, Fekl.
Gnomonia errabunda, Awd.
Phelonitis strobilina, Fr.
Cladosporium fasciculare, Fr.
C. Martianoianum, Thum.
C. diaphanum, Thum.
C. ampelinum, Pass.
Cercospora beticola, Sacc.
C. Solani, Thum.
C. Smilacis, Thum.
C. Thalictri, Thum.
C. acerina, Hart.
C. persica, Sacc.
C. Rhamni, Fekl.
C. Bupleuri, Pass.
Triposporium Juglandis, Thum.
Macrosporium Ravenelli, Thum.
M. diversisporium, Thum.
Fusicladium Aronici, Sacc.
F. dendriticum, Wallr.
F. orbiculatum, Thum.
F. pyrinum, Bon.
Dendryphium curtum, B. & Br.
Sporidesmium Maclure, Thum.
Ramularia Hellebori, Fekl.
R. didyma, Ung.
R. Nemopanthidis, C. & P.
Sporotrichum pulviniforme, Thum.
Isaria farinosa, Fr.
Fusisporium Buxi, Fr.
F. lacteum, Desm.
F. chenopodium, Thum.
Cystispora foliicola, Lib.
C. Therryana, Thum.
Sphacelia segetum, Lev.
Glœosporium filicinum, Rost.
G. Sibiricum, Thum.
G. ampelophagum, Sacc.
G. affine, Sacc.
G. Robergei, Desm.
G. Pisi, Oud.
G. paradoxum, Sacc.
G. sphaerelloides, Sacc.
Pestalozzia Planimi, Vize.
P. Acaciæ, Thum.
P. lignicola, Uke.
Diplodia carpinea, Thum.

Diplodia Incarvilleæ, *Thum.*
 D. Henriquesii, *Thum.*
 D. Molleriana, *Thum.*
 D. fœniculina, *Thum.*
 D. radiciperda, *Thum.*
 Dothichiza Sorbi, *Lib.*
 Micropera Pinastri, *Sacc.*
 Phoma negundicola, *Thum.*
 Aposphæria suffulta, *Thum.*
 Asteromella vulgaris, *Thum.*
 Phyllosticta Bolleana, *Thum.*
 P. nuptialis, *Thum.*
 Ascochyta Lactucæ, *Rostr.*
 Septoria æsculina, *Thum.*
 S. leguminum, *Desm.*
 Myxosporium colliculosum, *Berk.*
 Hendersonia Foueroyæ, *Thum.*
 Henriquesia lusitanica, *P. & T.*
 Heliscus Lugdunensis, *S. & T.*

Helminthosporium turcicum, *Pass.*
 Fusarium globulosulum, *Pass.*
 Fusidium stachydis, *Pass.*
 Epidochium ambiens, *Desm.*
 Botrytis cinerea, *Pers.*
 Exosporium Rubi, *Nees.*
 Penicillium glaucum, *Lk.*
 Passalora bacilligera, *Fr.*
 Stachybotrys lobulata, *Berk.*
 Septosporium curvatum, *Rabh.*
 Coniothecium didymum, *D. & M.*
 C. Mollerianum, *Thum.*
 Hydnum amicum, *Quel.*
 H. septentrionale, *Fr.*
 Irpex paradoxus, *Fr.*
 Microcrassus candidus, *Cohn.*
 Ectostroma Mulgedii, *Thum.*
 E. Macluræ, *Thum.*

Prof. W. R. Dudley, Ithaca, N. Y.

Sisymbrium canescens, *Nutt.*
 Draba arabisans, *Mx*
 Alyssum calycinum, *L.*
 Hypericum Canadense, *L.*
 Dianthus Armeria, *L.*
 Trifolium hybridum, *L.*
 Lespedeza Stuei, *Nutt.*
 Prunus pumila, *L.*
 Poterium Canadense, *Gr.*
 Agrimonia parviflora, *Ait.*
 Rubus neglectus, *Pk.*
 Cratægus coc. v. macracantha.
 Potentilla recta, *Willd.*
 P. fruticosa, *L.*
 P. palustris, *Scop.*
 Saxifraga aizoides, *L.*
 Chærophyllum procumbens, *Lam.*
 Lonicera hirsuta, *Eaton.*
 L. oblongifolia, *Muhl.*
 L. Xylosteum, *L.*
 L. Tartarica, *L.*
 Scabiosa australis, *Wulf.*
 Tragopogon pratensis, *L.*
 Polymnia Uvedalia, *L.*
 Coreopsis discoidea, *T. & G.*
 Pyrola sec. v. pumila, *Paine.*
 Moneses uniflora, *Gr.*
 Gerardia purpurea, *L.*
 Lobelia Kalmii, *L.*
 Calamintha acinos, *Claro.*
 Onosmodium Carolinianum, *D. C.*

Amarantus blitoides, *Wats.*
 Rumex Brittanica, *L.*
 Quercus Muhlenbergii, *Engelm.*
 Myrica Gale, *L.*
 Naias major, *All.*
 Sagittaria variabilis, *Engelm.*
 Aplectrum hyemale, *Nutt.*
 Spiranthes Romanzoviana, *Chapm.*
 Iris pseudacorus, *L.*
 Juncus alp. v. insignis, *Fr.*
 Elocharis rostellata, *Torr.*
 Scirpus Smithii, *Gr.*
 S. planifolius, *Muhl.*
 S. pauciflorus, *Lightf*
 Carex Steudelli, *Kunth.*
 C. tetanica, *Schk.*
 C. Grayii, *Carey.*
 C. hirta, *L.*
 C. flaccosperma, *Dew.*
 C. Hitchcockiana, *Dew.*
 Oryzopsis Canadensis, *Torr.*
 Aira cæspitosa, *L.*
 Panicum virgatum, *L.*
 P. hispidum, *Muhl.*
 Eragrostis capillaris, *Nees.*
 Botrychium simplex, *Hitch.*
 B. matricariæfolium, *Braun.*
 Ophioglossum vulgatum, *L.*
 Isoetes Engel. v. gracilis, *Engelm.*
 Azolla Caroliniana, *Willd.*

Clarence Lown, Poughkeepsie, N. Y.

Cheilanthes vestita, *Sw.*
 Asplenium ebenoides, *Scott.*

Asplenium Bradleyi, *D. C. Eaton.*

(3.)

NEW STATIONS, REMARKS AND OBSERVATIONS.

The first thirteen species noticed are new to the Herbarium, the first eleven have not before been reported.

SISYMBRIUM CANESCENS, Nutt.

Watkins Glen, Schuyler county. *Professor W. R. Dudley*. In the manual, this plant is reported to have been found at Lucifer Falls, Tompkins county, by J. W. Chickering, but Prof. Dudley writes that he has searched for it in vain in that locality.

MALVA CRISPA, L.

Roadside, Petersburg, Rensselaer county. Escaped from gardens and sparingly naturalized.

LYCHNIS DIURNA, L.

With the preceding species. Also escaped from gardens and door-yards.

LONICERA XYLOSTEUM, L.

South Hill near Ithaca. A single shrub was found growing in a pasture where there was an abundance of *Lonicera Tartarica*, L. *Dudley*. Both species have also been introduced about Albany where the latter also takes the lead in establishing itself.

SCABIOSA AUSTRALIS, Wulf.

Established about Union Springs, Cayuga county. *Dudley*.

CALAMINTHA ACINOS, Clærv.

Roadsides near Ithaca. Introduced. *Dudley*.

AMARANTUS BLITOIDES, Wats.

About Albany. *G. W. Clinton*. Union Springs and Frontenac Island, Cayuga lake. *Dudley*. Introduced from the West. In its foliage it resembles the very common *Amarantus albus*, but it has long prostrate spreading stems and branches and much larger seeds than that species.

IRIS PSEUDACORUS, L.

Near Ithaca. Also established in two localities in alluvial soil near Cayuga lake. *Dudley*.

CAREX HIRTA, L.

South Hill, Ithaca. Near the Delaware, Lackawana and Western railroad and apparently introduced. *Dudley*.

CAREX FLACCOSPERMA, Dew.

South Hill, Ithaca. *Dudley*. A stout form of *Carex laxiflora* var. *intermedia* sometimes occurs about Albany, which resembles this species in general aspect but it is readily distinguished from it by its much longer scales and different perigynia.

ASPENIUM EBENOIDES, R. R. Scott.

Near Saugerties, Ulster county. Growing on limestone rocks in company with the walking fern, *Camptosorus rhizophyllus*. *C. Lown*. Mr. Lown had previously found a few specimens of this extremely rare fern about four miles south-east of Poughkeepsie. In this case as in all others it was associated with *Camptosorus rhizophyllus* and *Asplenium ebeneum*, the three growing within a foot of each other. In the Saugerties locality the *Asplenium ebeneum*, though present, was several feet distant.

SEDUM ACRE, L.

Roadside, Petersburg. Escaped from cultivation and sparingly naturalized.

SAGITTARIA PUSILLA, Nutt.

In the New York Flora this species is recorded as occurring on "muddy banks of the Hudson where the water is brackish, as at West Point and Peekskill." The habitat attributed to it in the Manual is, "inundated shores, from eastern New Jersey and Philadelphia southward near the coast." It was recently detected by *Mr. H. N. Johnson* along the river shore at Coeymans, a few miles below Albany. This is a long distance from the usual stations of the plant and far above the reach of brackish water.

THALICTRUM ANEMONOIDES, Mx.

Coeymans. *Johnson*. This species manifests a strong disposition to produce double flowers. A few years ago Mr. Johnson took some of the plants from their native habitat and set them in his garden. The past season they developed double flowers. The exterior sepals are green and bract-like, but the inner, which are numerous, are white and petal-like. No stamens exist in any of the flowers and no pistils in some, thus indicating that the stamens have been transformed into petals.

ALYSSUM CALYCINUM, L.

University grounds, Ithaca. Introduced. *Dudley*.

DRABA ARABISANS, Mx.

Esty Glen and shore of Cayuga lake. *Dudley*.

LEPIDIUM CAMPESTRE, L.

Near Ithaca. *Dudley*. Also near Coeymans and rapidly spreading over the State.

LESPEDEZA STUVEI, Nutt.

Ithaca. *Dudley*.

RUBUS NEGLECTUS, Pk.

West shore of Cayuga lake. *Dudley*.

POTENTILLA RECTA, Willd.

Near Moravia. *Dudley*.

AGRIMONIA PARVIFLORA, Ait.

Freeville and Danby, Tompkins county. *Dudley*.

CRATÆGUS COCCINEA var. *MACRACANTHA*.

College campus, Ithaca and Union Springs. The thorns on the specimens are four to four and a half inches long.

PRUNUS PUMILA, L.

South Hill, Ithaca. *Dudley*. Some of the fruit is swollen into a pale, soft body, ovate or obovate in form and pointed at the apex. This is the result of an attack by a fungus, *Exoascus Pruni*, Fekl. This fungus also attacks the fruit of the wild plum, *Prunus Americana*, Marshall. I have also seen the fruit of our wild black cherry, *Prunus serotina*, swollen in a similar manner but the cause in this case was from an attack of an insect, the larvæ of which were found in the affected fruit.

SÉDUM REFLEXUM, L.

Thoroughly established by the roadside near Newark, Wayne county. *E. L. Hankenson*.

EPILOBIUM MOLLE, Torr.

Sphagnous marsh in "Cheney's woods," near Glens Falls. *Mrs. L. A. Millington*. The specimens sent are young plants and they show at the base a dense cluster of very small thick subterranean scale-like leaves, which might easily be mistaken for a cluster of small tubers. They are arranged in pairs on opposite sides of the stem, as are the leaves, and they appear whitish, thick and starchy like cotyledonous leaves. Their office is apparently similar to that of cotyledonous leaves, that is, to store up nutriment upon which the plant can draw at some subsequent period of its existence. They do not appear upon the base of old plants or those which have flowered and fruited. They are also found at the base of young plants of *Epilobium palustre*.

LONICERA OBLONGIFOLIA, *Muhl.*

Michigan Hollow, near Danby. *Dudley.*

SAXIFRAGA AIZOIDES, *L.*

Cliffs of Taghanic ravine, near Ithaca, growing with *Primula Mistassinica* and *Pinguicula vulgaris*. *Dudley.*

CHÆROPHYLLUM PROCUMBENS, *Lam.*

In "Negundo woods," near Ithaca. *Dudley.*

MITCHELLA REPENS, *L.*

Near Moravia. *M. F. Merchant*, M. D. This is the form that produces white berries, concerning which Dr. Merchant writes, "I have observed them quite closely for nearly three years and have watched their flowering two seasons and their fruiting three. The flowers are not dimorphous in this patch, but are all of one form, all having long exserted stamens and short pistils. The fruit is copious and without any tendency to change or approach the red-fruited form. The plants are thrifty and spreading and there are none of the red-fruited plants in the immediate vicinity."

COREOPSIS DISCOIDEA, *T. & G.*

Shores of Dryden lake. *Dudley.*

LOBELIA KALMII, *L.*

Farley's Point, Cayuga lake, growing along the shores and in meadows. A variety with stout stem and large flowers. *Dudley.*

PYROLA SECUNDA var. PUMILA, *Paine.*

Deep moss in a fir-tree swamp near Freeville. *Dudley.*

CALYSTEGIA SEPIUM, *L.*

Tunis, Lewis county. *C. D. Hill.* The specimen differs from the ordinary form of the plant in having the stem pubescent, the leaves narrow and the flower tube very short. The flowers appear as if they were double, but in their dried and pressed condition this appearance may be deceptive.

RUMEX BRITANNICA, *L.*

Shores of Owasco lake inlet. • *Dudley.*

COREMA CONRADII, *Torr.*

Shawangunk mountains, Ulster county. *C. E. Smith.* Long Island is the only locality in the State from which this pretty little evergreen heath-like shrub has previously been reported. Judging from the localities usually ascribed to it in the manuals, this

new station is much farther inland than the plant usually occurs. Its presence here gives an additional botanical interest to the Shawangunk mountains which have already furnished several very rare and interesting species of plants.

QUERCUS MUHLENBERGII, Engelm. (*Q. castanea*, Muhl.)

"Big Gully" near Union Springs. *Dudley*. This is the *Q. Prinus* var. *acuminata* of the Manual, *Q. acuminata*, Mx., but it is regarded by Dr. Engelmann as quite distinct from *Q. Prinus*. It is a rare species in our State, its proper home being, according to Dr. Engelmann, in the Mississippi valley. In the New York Flora it is attributed to Chemung county on the authority of Dr. Knieskern. There are two forms of it; one having lanceolate narrow leaves, five to six inches long and one and a half to two inches broad, with acuminate apex and sharp teeth; the other having broadly ovate or obovate leaves, six or seven inches long and four or five inches broad, with broader and more rounded teeth. Our specimens belong to the narrow-leaved form.

MYRICA GALE, L.

Locke pond, Cayuga county. *Dudley*.

SAGITTARIA VARIABILIS var. *HASTATA*, Engelm.

Summit marsh, Spencer, Tioga county. *Dudley*. The specimen shows long linear and lanceolate phyllodia; also stolons giving rise to young plants. The variations in this well-named *Sagittaria* are exceedingly numerous. Specimens collected at Coeymans have the leaves of variety *latifolia*, but all the flowers staminate on some plants, thus passing to the diœcious inflorescence of variety *obtusata*. Specimens of variety *gracilis* from the same place have, in some cases, all the leaves without lobes, in others some leaves are lobed, others, lobeless. A specimen of this variety from Long lake has the fruiting heads almost sessile, as in *S. heterophylla*. Specimens of variety *hastata* and variety *angustifolia* also sometimes occur with diœcious inflorescence.

NAIAS MAJOR, All.

Foot of Cayuga lake. A slender form with long internodes and long narrow leaves. Black lake, a shallow pond four miles below Cayuga lake. A short, stout, dark or purplish-colored leafy form with dichotomous recurved habit and slightly curved and more distinctly reticulated fruit. *Dudley*.

APLECTRUM HYEMALE, Nutt.

West Dryden. *Dudley*.

SCIRPUS SMITHII, *Gr.*

Shore of Cayuga lake, near Union Springs. *Dudley.*

CAREX STEUDELII, *Kunth.*

Six-mile creek, near Ithaca. *Dudley.*

ERAGROSTIS PURSHII, *Schrad.*

Waste places about Albany. *Clinton.* This southern grass is rapidly extending its range northward. Last year it was reported from Yonkers, this year it appears to be well established at Albany. It appears, like many other introduced plants, to follow the lines of the railroads which are a powerful agency in extending the distribution and range of species and in intermingling the floras of different localities. This grass closely resembles its congener, *E. pilosa*, from which it is most readily distinguished by the naked axils of its panicle.

ERAGROSTIS CAPILLARIS, *Nees.*

Ithaca. *Dudley.* A dwarf form three or four inches high.

CHEILANTHES VESTITA, *Sw.*

Two miles below Poughkeepsie on the east side of the river. It occurs also on the west side of the river, but in blasting the rocks for the West Shore railroad, its station may have been destroyed.
C. Lown.

ASPLENIUM BRADLEYI, *D. C. Eaton.*

Shawangunk mountains, Ulster county. *Lown*

BOTRYCHIUM SIMPLEX, *Hitch.*

Danby. *Dudley.* The specimens are well developed and belong to the varieties *incisum* and *subcompositum*.

BOTRYCHIUM MATRICARIFOLIUM, *A. Braun.*

McLean, Tompkins county. *Dudley.* Both these species and the more rare *B. lanceolatum*, Angst., occur in Petersburg, Rensselaer county, growing together.

ISOETES ENGLEMANNI var. GRACILIS, *Engelm.*

Locke pond. *Dudley.*

AZOLLA CAROLINIANA, *Willd.*

Foot of Cayuga lake. *Dudley.* Sodus bay. *Hankenson.* The Cayuga lake specimens are much more dense and compact in habit than the Sodus bay specimens.

(4.)

NEW YORK SPECIES OF PSALLIOTA.

"Stem annulate, distinct from the hymenophorum; lamellæ free."
Hymen, Europ., p. 278.

The name of the subgenus *Psalliota* is derived from the Greek word *Ψάλλιον* (*Ψελλιον*), a bracelet or armlet. Its application to these *Agarics* was probably suggested by the annulus or ring which encircles the stem. The species of this subgenus correspond in structure to those of the subgenus *Lepiota* in the *Leucospori* or white-spore series and to those of the subgenus *Annularia* in the *Hyporhodii* or pink-spore series. The tendency of the flesh in some species of *Psalliota* to change color when cut or bruised corresponds also to a similar tendency in some of the *Lepiotæ*. No corresponding subgenus has yet been established in the *Dermini* or ochraceous-spore series, nor in the *Coprinarii* or black-spore series. The *Agarics* belonging to the subgenus *Psalliota* are generally of medium or large size and rather attractive in appearance until the lamellæ have assumed the blackish color of age. They are most abundant in late summer or autumn, but in warm wet weather some of them occur early in the season also. The pileus is more or less fleshy but usually rather brittle or easily broken. It may be either smooth, fibrillose or scaly. Sometimes even individuals of the same species exhibit pilei with all these characters. The fibrillose pileus of a young individual may become either smooth or scaly with age. No species having a viscid pileus appears yet to have occurred either in our State or in Europe, though an Ohio species *A. fabaceus*, Berk., is described as having the pileus viscid when moist. The lamellæ are generally close or crowded and rounded at their inner extremity and not attached to the stem. They change color with advancing age, becoming darker as they grow older. This change of color is in great measure due to the development of the spores which cause the lamellæ to assume their own brown or blackish-brown hue. The lamellæ of young plants are generally whitish or pallid, changing in some species, directly from this color to the brown color of maturity, and in others, assuming an intervening pinkish rosy or reddish hue before taking on the final dark or sombre color. The exceptional *A. fabaceus* is described as having the lamellæ brown even in the young plant, but even in this case they are said to become darker with age. In the common mushroom, *A. campestris*, they may become moist or subdeliquescent when old, thus indicating a relationship with the inky species of the genus *Coprinus*. The stem is fleshy and furnished with an annulus or ring, which in some species varies in its degree of development, and in others is more or less thin and somewhat evanes-

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cent. The spores in our species are quite small, elliptical or subelliptical in outline and do not vary greatly in dimensions in the different species.

Fries groups the European species in two sections which he names "Edules," and "Minores." The former group includes the larger and more fleshy species. Several of them are edible and have long been used as an article of food. No representatives of the "Minores" have yet been found in our State. Of the "Edules" we have several species which may again be divided into two sub-groups depending on their usual habitats. Those which grow in open places, manured grounds or cultivated fields generally have a thicker, firmer pileus and a comparatively shorter stouter stem than those that grow in copses groves and woods. It is among these especially that the most notable succulent "mushrooms" are found.

SYNOPTICAL TABLE OF THE SPECIES.

Growing in fields, open places or cultivated grounds	2
2. Lamellæ at first whitish or pallid.....	3
2. Lamellæ at first pinkish or flesh colored.....	A. campestris.
3. Lamellæ narrow, stem solid	A. Rodmani.
3. Lamellæ broader, stem stuffed or hollow.....	A. arvensis.
1. Growing in woods, copses or groves.....	4
4. Stem bulbous	5
4. Stem not bulbous	6
5. Pileus smooth.....	A. silvicola.
5. Pileus squamulose.....	A. placomyces.
6. Pileus two inches or more in diameter.....	A. silvaticus.
6. Pileus less than two inches in diameter	A. diminutivus.

AGARICUS CAMPESTRIS, L.

Common Mushroom. Edible Mushroom. Field Agaric.

Pileus at first hemispherical or convex, then expanded with de-curved margin or nearly plane, smooth silky floccose or hairy squamu-lose, the margin extending beyond the lamellæ, the flesh rather thick, firm, white; lamellæ free, close, ventricose, *at first delicate pink or flesh color*, then blackish-brown, *subdeliquescent*; stem equal or slightly thickened toward the base, *stuffed*, white or whitish, nearly or quite smooth; annulus at or near the middle, more or less lacerated, some-times evanescent; spores elliptical, .00025 to .0003 in. long, .00016 to .0002 in. broad.

Plant 2 to 4 in. high, pileus 1.5 to 4 in. or more broad, stem 4 to 8 lines thick.

Fields, pastures, manured grounds, mushroom beds, etc.

This is the well-known "edible mushroom," a species which is more extensively cultivated and more generally used as food than any other. With proper attention to its characteristic features there is no need of

its being mistaken for or confused with any deleterious or poisonous species.

The pileus is nearly always regular in shape, rather thick and moderately firm, hemispherical or convex when young but usually becoming more flattened or nearly plane with age.

In its young state it is adorned with fine silky or hairy fibrils which sometimes, with advancing age, form minute persistent tufts or scales and sometimes disappear altogether, leaving the surface quite smooth. The decurved margin usually extends a little beyond the extremity of the lamellæ. The cuticle or skin is more or less readily separable from the flesh, which is white, but sometimes manifests a tendency to change color slightly when cut or bruised, and to exhibit pinkish or reddish stains. The color of the pileus in the wild form is usually white or whitish with us, but in the cultivated forms it is often ochrey-brown or pale tawny, and varieties sometimes occur in which it is brown.

The lamellæ have a very beautiful and delicate pinkish hue which is apparent as soon as they are exposed to the light by the separation of the concealing veil from the margin of the pileus. This color gradually becomes darker with advancing age until it finally changes to a dark brown or almost black hue. This character is one of the best by which to distinguish the "edible mushroom" from all other Agarics, except its nearest allies, *A. Rodmani* and *A. arvensis*. And even from these, when young, it may readily be distinguished by the primary color of its lamellæ. The subgenera *Annularia* and *Pluteus* in the pink-spore series contain species the lamellæ of which exhibit similar pinkish colors, but these never change to brown or blackish-brown as the plant matures or becomes old. In the mushroom the lamellæ are rounded at their inner extremity and not attached to the stem, so that generally in mature specimens there is a small free space between it and them.

The stem is commonly short in proportion to the breadth of the pileus, its length being, in most cases, less than the horizontal diameter of the pileus. Ordinarily it is cylindrical in shape, though now and then instances occur in which it may either be slightly thickened or slightly narrowed toward the base. The central portion of the stem is a little softer in texture than the external portion, hence it is said to be stuffed. The annulus encircles it at or near the middle. It is sometimes quite thin and flabby and is then easily torn and destroyed.

The mushroom, like many other plants which have been the subject of long and extensive cultivation, has given rise to several forms which exhibit quite marked distinctive features. These forms differ

so much from the original typical form that they have received distinguishing names and are called varieties. The following are the principal ones.

Var. *albus*. White variety. Pileus smooth or slightly silky-fibrillose, white or whitish, stem short.

This is our most common variety. It occurs in unfrequented streets, waste places, cultivated grounds and especially in rich pastures where the grass is kept short. It usually appears in August and September, but sometimes in warm, wet weather it is found early in the season. A very large form with the pileus six or seven inches broad sometimes occurs.

Var. *pratensis*. Meadow variety. (*A. pratensis*, Vitt.) (*A. pratensis*, Handbook.) Pileus adorned with reddish scales, flesh somewhat tinged with pink. This variety must be uncommon with us. I have seen no examples of it, nor of the three following varieties:

Var. *umbrinus*. Brown variety. Pileus smooth, brown; stem stout and minutely scaly.

Var. *rufescens*. Reddish variety. Pileus reddish, minutely scaly; lamellæ at first white; stem elongated; flesh turning bright red when cut or bruised. This departs so decidedly from the ordinary characters of the type, especially in the white color of the young lamellæ, that it seems to merit separation as a distinct species.

Var. *villaticus*. Villa variety. (*A. villaticus*, Brond.) Plant large, pileus scaly; stem scaly, coated or subvolvate by the inferior veil. In the Handbook of British Fungi this is placed as a variety of *A. arvensis*, but most authors regard it as a variety of *A. campestris*.

Var. *hortensis*. Garden variety. Pileus brownish or ochrey-brown, bearing hairy fibrils or minute scales. This is often cultivated and is occasionally exposed for sale in the markets of Albany.

Var. *Buchanani*. Buchanan's variety. Pileus white, smooth, depressed in the center, the margin naked; stem stout; annulus thin, lacerated. A rare variety sometimes occurring in mushroom beds.

Var. *elongatus*. Long-stem variety. Pileus small, smooth, convex, the margin adorned with the adherent remains of the lacerated veil; stem long, slender, slightly thickened toward the base; annulus slight or evanescent. This is also a variety of mushroom beds.

Var. *vaporarius*. Green-house variety. (*A. vaporarius*, Vitt.) Pileus brownish, coated with long hairs or fibrils; stem hairy-fibrillose, becoming transversely scaly. Conservatories, cellars, etc. Not differing greatly from Var. *hortensis*.

AGARICUS RODMANI, *Pk.*

Rodman's Mushroom.

Pileus rather thick, firm, at first convex, then nearly or quite plane, with decurved margin, smooth or rarely slightly rimose-squamose on the disk, white or whitish, becoming yellowish or subochraceous on the disk, the flesh white, unchangeable; lamellæ close, *narrow*, rounded behind, free, reaching nearly or quite to the stem *at first whitish, then pink or reddish-pink*, finally blackish-brown; stem short, subequal, *solid*, whitish, smooth below the annulus, often furfuraceous or slightly mealy-squamulose above; annulus variable, thick or thin, entire or lacerated, at or below the middle of the stem; spores broadly elliptical or subglobose, generally uninucleate, .0002 to .00025 in. long, .00016 to .0002 in. broad.

Plant 2 to 3 in. high; pileus 2 to 4 in. broad; stem 6 to 10 lines thick.

Grassy ground and paved gutters. Astoria, Long Island. *Rev. W. Rodman.* Washington Park, Albany. May to July.

This species is intermediate between *A. campestris* and *A. arvensis*, from both of which it may be distinguished by its narrow lamellæ, solid stem and smaller, almost globose, spores. In size, shape of the pileus and general appearance it most resembles *A. campestris*, but in the whitish primary color of the lamellæ and in the yellowish tints which the pileus often assumes, it approaches nearer to *A. arvensis*. The pileus, which is usually smooth, occasionally manifests a tendency to crack into small areas or scales on the disk. The flesh is quite thick and firm, its thickness generally much exceeding the breadth of the lamellæ. This character, together with the solidity of the stem, indicates a disposition in the species to produce flesh rather than fruit and may make it more desirable for cultivation than the common mushroom. The length of the stem, in all the specimens I have seen, is less than the breadth of the pileus. Its shape is nearly cylindrical. The annulus is generally rather thick and sometimes projects both above and below in such a manner that it appears like a grooved band or collar surrounding the stem. In some instances it is so near the base that it suggests the idea of a volva. Its lower or exterior surface is occasionally rimose, thereby indicating another point of resemblance between this species and *A. arvensis*. In this respect, as well as in its solid stem and narrow lamellæ, it also approaches *A. augustus*, a large and showy European species which has not yet occurred with us, but which may be known by its lamellæ changing at once from the pallid color of immaturity to the dark-brown hue of age, without exhibiting any intervening pinkish tints.

The species is respectfully dedicated to its discoverer. Its edible qualities are deemed equal to those of the common edible mushroom. It has been tested by Mr. G. Rodman. It is apparently a rare species, but may be more common than is supposed, for it may possibly have been heretofore confused with the common mushroom, which it much resembles in color, the pileus being at first white or whitish, although it soon assumes yellowish tints or becomes a pale ochrey-red or russet color on the disk.

AGARICUS ARVENSIS, *Schæff.*

Horse Mushroom. Plowed-land Mushroom.

Pileus at first convex or conical-campanulate, then expanded, at first more or less floccose or mealy, then smooth, white or yellowish, flesh white; lamellæ close, free, generally broader anteriorly, *at first whitish, then pinkish*, finally blackish-brown; stem equal or slightly thickened toward the base, smooth, *hollow or stuffed* with a floccose pith; annulus rather large, thick, the lower or exterior surface often cracked in a radiate manner; spores elliptical, .0003 to .0004 in. long, .0002 to .00025 in. broad.

Plant 2 to 5 in. high; pileus 3 to 5 in. or more broad; stem 4 to 10 lines thick.

Cultivated fields and pastures. Summer and autumn.

This species is so closely related to the common mushroom that it is regarded by some authors as a mere variety of it. Even the renowned Persoon is said to have written concerning it, "It appears to be only a variety of *A. campestris*." Cordier says of it, "Distinguished from *A. campestris* by its pure white color, more pale lamellæ, its white flesh not changing color when cut or bruised, its lamellæ remaining pale a long time and not deliquescing." Fries also says that it is commonly not distinguished from *A. campestris*, but that it is diverse in some respects; its white flesh being unchangeable, its lamellæ never deliquescing, remaining a long time pale and not becoming dark red in middle age. Berkeley says of it, "A coarse, but wholesome species, often turning yellow when bruised."

In size the horse mushroom often exceeds the common mushroom, its pileus, according to the Handbook, sometimes attaining a breadth of eighteen inches and its stem a thickness of one to two inches. The white color of the pileus often becomes tinged with yellow, either with age or in drying. The pale primary color of the lamellæ, the thick, well-developed annulus and the hollow stem are available features for distinguishing it from its close allies. It is less common with us than *A. campestris*, to which in edible qualities it is very similar. *A. Georgii*, Sow., *A. pratensis*, Scop., *A. edulis*, Krombh., and *A. exquisitus*, Vitt., are synonyms.

AGARICUS SILVICOLA, Vitt.

Silvan Mushroom.

Pileus convex or subcampanulate, sometimes expanded or nearly plane, *smooth, shining*, white or yellowish; lamellæ close, thin, free, rounded behind, generally narrowed toward each end, *at first whitish, then pinkish*, finally blackish-brown; *stem long*, cylindrical, stuffed or hollow, white, *bulbous*; annulus either thick or thin, entire or lacerated; spores elliptical, .00025 to .00032 in. long, .00016 to .0002 in. broad.

Plant 4 to 6 in. high; pileus 3 to 6 in. broad; stem 4 to 8 lines thick.

Woods, copses and groves or along their borders. Summer and autumn.

Many authors place this as a variety of *A. campestris*, but as it occurs with us its characters are very constant and well marked and enable it to be distinguished from that species with great facility. It generally attains a larger size, has a smoother, more shining pileus, which is usually tinged with yellow, it has the primary color of the lamellæ whitish, and its stem is longer and proportionately more slender and distinctly bulbous. It has, as Fries suggests, more points of resemblance to *A. arvensis* than to *A. campestris*, but its bulbous stem at once separates it from that species. The bulb is peculiar, it being small but very abrupt and depressed or flattened like a common turnip. The pileus is thin in proportion to its breadth and is quite fragile, so that the plants must be handled with care to prevent its being broken. In mature plants the margin of the pileus sometimes has a lurid or dull purplish tint, which is probably derived from the color of the spores.

The annulus is often tinged with yellow exteriorly and is sometimes radiately rimose on the lower surface like that of *A. arvensis*. In some instances fragments of it remain attached to the margin of the pileus. The plants sometimes grow in close groups or tuft-like clusters. *A. edulis*, Berk., is given as a synonym.

It is reported to be esculent, but I have not tested it. Persons unacquainted with it should guard against confounding immature specimens of it with the white forms of the phalloid agaric, *A. phalloides*, a poisonous species which grows in similar places and bears some resemblance to it. The poisonous *A. phalloides* has a much larger bulb to the stem and the lamellæ remain permanently white or whitish, showing at no age either the pinkish or blackish-brown hues which are so conspicuous in *A. silvicola*.

AGARICUS PLACOMYCES, *Pk.*

Flat-cap Agaric.

Pileus fleshy but rather thin, at first convex or campanulate, then expanded and quite plane, *squamulose*, whitish, *the disc and minute scales brown*; lamellæ close, free, *white, then pinkish*, finally blackish-brown; stem smooth, stuffed with a small pith slightly tapering upward, *bulbous*, whitish, the bulb stained with yellow and usually giving rise to one or two mycelioid white root-like processes; annulus large, flabby; spores elliptical, .0002 to .00025 in. long, .00016 to .00018 in. broad.

Plant 3 to 5 in. high, pileus 2 to 4 in. broad, stem 2 to 4 lines thick.

Under hemlock trees.* Oneida and Knowersville. July.

This rare but beautiful Agaric is easily distinguished from its allies by the bulbous stem and the perfectly flat white surface of the expanded pileus finely adorned by numerous minute brown scales. These scales are confluent on the disk where they form a brown spot, thus imitating in appearance many species of the subgenus *Lepiota*. Sometimes faint radiating striæ extend from the disk to the margin of the pileus. In damp weather the large thin annulus is sometimes studded with drops of moisture of a dark color. Nothing is known concerning the edible qualities of the species. The specific name is derived from two Greek words, *πλακους*, a flat cake, and *μυκης*, a fungus, and has reference to the very flat horizontally expanded pileus.

AGARICUS SILVATICUS, *Schæff.*

Wood Agaric.

Pileus thin, at first convex or campanulate, then expanded, *gibbous or subumbonate*, fibrillose or variegated with a few thin tawny brownish or reddish-brown *spot-like appressed scales*, whitish, brownish or smoky gray, the disk sometimes tinged with red or reddish-brown, the flesh white or faintly reddish; lamellæ thin, close, free, narrowed toward each end, reddish, then blackish-brown; stem rather long, *equal or slightly tapering upward*, hollow, whitish; spores elliptical, .0002 to .00025 in. long, .00016 to .0002 in. broad.

Plant 3 to 5 in. high, pileus 2 to 4 in. broad, stem 4 to 6 lines thick.

Woods. Summer and autumn. Not common.

The absence of a bulbous base to the stem and the fibrillose or feebly scaly pileus which is more or less gibbous or umbonate, serve to distinguish this from the two preceding species. Concerning its edibility,

Cordier says that it is at least suspicious and that Vivian pronounces it "pernicious." Its odor is strong and its flesh when cut assumes a slight yellowish tint.

AGARICUS DIMINUTIVUS, *Pk.*

Diminutive Agaric.

Pileus thin, fragile, at first convex, then plane or centrally depressed, sometimes slightly umbonate, whitish or alutaceous, faintly spotted with small thin silky appressed brownish scales, the disk brownish or reddish-brown; lamellæ close, thin, free, ventricose, brownish-pink becoming brown, blackish-brown or black; stem equal or slightly tapering upward, stuffed or hollow, smooth, pallid; annulus thin, persistent, white; spores elliptical, .0002 in. long, .00015 to .00016 in. broad.

Plant 1.5 to 2 in. high, pileus 1 to 1.5 in. broad, stem 1 to 2 lines thick.

Woods. Croghan and Sandlake. Autumn.

This is a small but symmetrical and beautiful Agaric. It is perhaps too closely related to the preceding species of which it may possibly prove to be a mere variety or dwarf form. Its pileus is quite thin and fragile. Usually the darker or reddish hue of the disk gradually loses itself in the paler color of the margin, but sometimes the whole surface is tinged with red.

In closing this brief report my most cordial thanks are tendered to those botanists who have aided me by contributing specimens and information, and their continued co-operation in the work now well advanced is most earnestly solicited.

Respectfully submitted,

CHAS. H. PECK.

ALBANY, January 8, 1883.

[Sen. Doc. No. 53.] 7

SOME ABNORMAL AND PATHOLOGIC FORMS OF FRESH-WATER SHELLS FROM THE VICINITY OF ALBANY, NEW YORK.

BY CHARLES E. BEECHER.

Monstrosities among fresh-water shells are not infrequent and are interesting as illustrative of the cause of natural or accidental deformity. A large proportion of abnormal or pathologic forms is found in exposed situations, where the shells are subject to varying conditions of water and materials brought by currents or otherwise. The annual draining and cleaning of the canals renders the contained organisms liable to many accidents. It is likewise found that in the vicinity of a ford or watering-place for cattle, many of the unioes bear the marks of injury. It is, while the animal is repairing these injuries and adapting itself to changing conditions of water and deposits, that most of the malformations in its shell are produced, and it is quite seldom that a shell is found which has been deformed by the atrophy or hypertrophy of any of the animal organs. These malformations are occasionally transmitted and their degree is often augmented by the action of the law of accelerated heredity, as applied to the mollusca by Professor Alpheus Hyatt.*

It is convenient to consider abnormalities as natural or accidental. Natural changes are usually produced by the action of gravitation, adaptation to modified habitats or by changes in the forms of the organs. The effects of gravitation are noticed mainly in those univalves which live at or near the surface of the water and, therefore, necessarily carry the weight of the shell at a disadvantage.

Accidental deformities are always the accompaniment of an attempt by the animal to repair injuries which it has received. If the form of the shell has been altered, the animal will accommodate itself to this alteration; and, on the contrary, if permanent injury or malformation has been produced in the soft parts of the animal, the accreting test will gradually adjust itself to this change in those parts.

* The Genesis of the Tertiary Species at Steinheim, by Alpheus Hyatt; page 27, Anniversary Memoirs of the Boston Society of Natural History, 1880.

One of the most noticeable and interesting examples of a departure from normal conditions is sinistrality. With some genera and species (*Partula*, *Achatinella*, *Bulimus*, etc.) the dextral or sinistral shells occur indifferently. Thus, from a sinistral specimen of *Campeloma*, Raf. (*Melantho*, Bodw.) were taken two sinistral fry. The remaining twenty-five were dextral. Also, some of the fry of dextral individuals are very often sinistral. In other genera only certain (*supra*) species are sinistral, and again in some entire genera (*Physa*, *Clausilia*, etc.) this is a constant feature. Many genera and species have not yet furnished a single example. Two remarkable sinistral forms are given in the present paper. Several others, among our land and fresh-water shells, are known from the State of New York, but not in the vicinity of Albany. Individuals are found among our uniones which have the cardinal and lateral teeth interchanged in the valves, thus giving to the right valve the form and number of teeth belonging to the left. This kind of sinistrality is of unusual occurrence, and has been rarely noticed.

Upon the authority of Professor R. Ellsworth Call, I am able to cite the following species in which he has observed the above reversion of teeth: *Unio complanatus*, Mohawk, N. Y.; *U. rubiginosus*, Des Moines, Iowa, and *U. cahawbensis*, Cahawba river, Alabama. He has also had the kindness to make several valuable suggestions and corrections in the subject matter of the present paper.

DESCRIPTION OF SPECIMENS.

PHYSA ANCILLARIA, Say.

Plate I, figs. 6-8.

Figure 6 represents a specimen with an unusually expanded aperture. The first thickening of the labrum is immediately succeeded by another thickening of the margin, which is also flexed outward and produces the enlargement.

The second specimen, figure 7, exhibits the tendency of the outer volution to become free. The suture is very deeply impressed nearly to the columella, and the aperture is much shortened.

These two specimens exhibit natural departures, while figure 8 represents an accidental deformity, in which the margin of the aperture is deeply excavate and the lower part of the labrum is sinuate.

PLANORBIS EXACUTUS, Say.

Plate I, figs. 1-3.

The examination of a large series of specimens from the vicinity of Albany shows that this species frequently departs from its normal form. Individuals with expanded and variously modified apertures are not uncommon and one sinistral example has been detected.

Figure 1 represents an individual in which the upper side of the labrum is expanded.

Figure 2 represents an individual in which the entire aperture is inflated, especially on the lower side.

The sinistral specimen (figure 3) has lost nearly all the testaceous characters belonging to the species and is a monstrosity in every particular. It is impossible to determine from external evidence whether it is a case of true sinistrality or one of inverted growth. The volutions are of equal convexity on either side and the obliquity of the aperture is not determinative. The specimen was found in a locality abounding only in this species, and the three specimens here described were selected from among several thousand others, about two per cent of which show some departure from normality, principally in variations in the form of the aperture and elevation of the spire and in intermittent growth.

VALVATA TRICARINATA, Say.

Plate I, fig. 9.

The volutions of the specimen are free except at the apex. This variation in this species has been recorded by several observers and is not extremely rare, although this is the only specimen which has been found in the vicinity of Albany.

GILLIA ALTILIS, Lea.

Plate I, fig. 5.

A very remarkable biflexed individual. The shell, for a considerable period of its growth, equal to the formation of the three initial volutions, is dextral and of the usual form. The spiral then changes its direction; the apex becomes partially inverted and the last volution is sinistral. This is the only example of a heterospiral growth that is known to me and cannot be satisfactorily accounted for from the appearance of the shell alone. An examination of the anatomy of the animal might have revealed the cause of this reversion of growth. The initial point of the operculum being nearer to the apex of the shell, indicates that the growth was inverted during the formation of the last volution, and suggests, as a possible explanation, the action of gravitation on an animal too weak to hold the shell on its dorsum.

SOMATOGYRUS SUBGLOBOSUS, *Say*.

Plate I, fig. 4.

The carination of the volutions and narrowing of the upper part of the aperture is often observed in individuals of this species. The specimen figured is an extreme development in these particulars, and presents a marked departure from the usual form.

UNIO PRESSUS, *Lea*.

Plate I, figs. 10-12.

Figure 10 represents the left side of a specimen which is unusually alate at the post-cardinal extremity. The outer zone of growth slopes rapidly to the pallial margin and is marked by the absence of the colored radii. In the specimen the body of the shell is of a dark-green color, while the last annulus of growth is yellow and presents a strong contrast with the remaining portion of the shell.

The next figure (figure 11) represents a specimen which received an injury during the early growth of the shell. The margin of the valve is flexed and there is a broad mesial depression in the right valve extending from the umbo to the margin. In the left valve the conditions are reversed, the depression in the right valve being represented by a corresponding plication.

Figure 12 shows a left valve with the anterior portion narrow and auriculate, the umbo oblique and the wing much reduced. The teeth of this specimen are also much modified: in the left valve there is a single continuous elevated tooth which is sinuate anteriorly to represent the cardinal teeth. In the right valve the teeth are quite rudimentary and the strong cardinal ridge of the opposite valve projects into the rostral cavity.

UNIO CARIOSUS, *Say*.

Plate I, fig. 13.

The figure represents a small gibbous female with the anterior end unusually narrowed. Individuals of a similar character are not unusual, although they are seldom as ventricose as in the present instance.

UNIO NASUTUS, *Say*.

Plate II, fig. 1.

A female showing a row of seven vertical plications on the zone of growth adjacent to the last, with obscure traces of similar plications made at an earlier period of development.

UNIO COMPLANATUS, *Solander.*

Plate II, figs. 2-6.

Figure 2 represents a specimen similar to the preceding, but with more numerous and stronger vertical plications. The shell in these species is normally smooth and we must seek for an explanation of the cause of the plications in the soft parts of the animal, as they are evidently not due to accidental causes. From the examination of a number of individuals presenting these plications in various degrees of prominence, and from the inspection of the living animal, it is evident that these abnormal features are produced by the rapid growth of the shell over the gills while they are distended with fry. *Unio osbeckii*, a species from China, is classed with the plicate forms in Lea's *Synopsis of the Unionidae*, but the plications do not seem to be a constant characteristic of the species. The plications are not always present and, when they do occur, they are usually obscure and similar in position and expression to those specimens of *U. nasutus* and *U. complanatus* here presented and probably have a like significance.

Figure 3 represents the right valve of a specimen modified by accidental deformity. The umbo is nearly central, and the upper anterior portion of the valve is flattened and deeply sulcate.

The next specimen (figs. 4, 5) is a very elongate cylindrical form with an excessively thickened pallial margin.

The last individual to be noted (fig. 6) is an apparently normal form, as no marks of accidental or natural deformity can be detected. It was found associated with numerous specimens of *U. complanatus*, and is here referred to this species, although seemingly presenting marked specific differences. The outline is regularly elliptical, and the prominent beak is situated just anterior to the middle of the length. The cardinal teeth are elongate, and the lateral tooth is short and oblique — characters which do not belong to *U. complanatus*. Should it ultimately prove of a distinct species, it would be of a form hitherto unknown to this locality.

Specimens similar to the preceding briefly noted forms are often overlooked or considered as unimportant by many collectors; but to a student of morphological variation and possible specific change, they are extremely interesting. After numerous accidental and natural changes have been illustrated and described, embracing many genera and species, it will be possible to generalize important biological facts relating to the classification of species and manner of growth of the organisms.

BRYOZOA

(FENESTELLIDÆ)

OF THE

HAMILTON GROUP.*

By JAMES HALL.

FENESTELLA MULTIPLEX, *n. sp.*

Bryozoan, occurring only in fragments; the shape of the frond is uncertain, but probably is infundibuliform; fragments of six centimetres in width occur, evidently only a small portion of the whole frond.

Branches moderately strong, enlarging below the bifurcations, and the width just above bifurcation is .33 mm., below bifurcation .66 mm. or slightly less. The distance between the branches is variable; there are on different portions of the frond five or six branches in the space of five millimetres; on non-poriferous side the branches are angular, and have along the middle a slight keel or carina, which connects with a similar carina on the dissepiments; when the dissepiments on opposite sides of a branch are alternating, the carina of the branch, in connecting with the carina of the dissepiment, becomes zigzag, which causes the branches to appear more irregular and less rigid than on the poriferous side; the branches are smooth.

Dissepiments about .25 mm. in diameter, four in the space of five millimetres; on non-poriferous side slightly depressed, angular and carinated; on poriferous side, depressed, rounded.

Fenestrules, on non-poriferous side, subquadrangular in outline; on poriferous side oval; length about one millimetre, width varying from one-third to two-thirds the length.

Cells in from two to four ranges, occurring as follows: In a branch which from commencement to bifurcation is six millimetres in length, for one millimetre only two ranges of cells occur, three ranges for the

* The species of the present paper only partially represent the genus as occurring in the Hamilton group. It is published in this incomplete form in order to show the progress of the work upon the Bryozoans, and to facilitate the final revision of the species.

space of three millimetres, and for the remaining two millimetres four ranges of cell apertures. Cells minute, circular, about .12 mm. in diameter, distant from each other equal to the diameter of an aperture, twenty in the space of one millimetre, four in the space of one fenestrule, counting those opposite the dissepiment; margins distinctly elevated, and those of the outer rows indenting the border of the fenestrule; apertures sometimes alternating and forming oblique transverse rows, at other times irregularly arranged; where two rows occur the apertures open directly upward; where three or four rows occur the central row or rows open directly upward, and the two outer rows laterally; space between rows of apertures smooth.

Formation and localities. Hamilton group; Moscow, Livingston county, and Alden, Erie county, N. Y.

FENESTELLA LATITRUNCATA, *n. sp.*

Bryozoan, occurring only in fragments; the form of frond is not certainly known, but probably is infundibuliform.

Branches strong, gradually enlarging to the bifurcations; width just below bifurcation one and one-third millimetres, just above, two-thirds to three-fourths of one millimetre; the distance between the branches is from one-half to four-fifths of one millimetre; three to four branches in the space of five millimetres; on non-poriferous side the branches are slightly angular.

Dissepiments about .5 mm. in diameter, slightly expanding at their junction with the branches, two in the space of five millimetres; on non-poriferous side, on a plane with the branches, slightly arching and angular; on poriferous side slightly depressed, rounded.

Fenestrules, on non-poriferous side, subquadrangular; on poriferous side oval, in outline; length one and three-fourths millimetres.

Cells arranged in from three to six ranges; cell apertures minute, circular .14 mm. in diameter, distant from each other a little more than the diameter of an aperture, sixteen in the space of five millimetres longitudinally; margins distinctly elevated, and those of the outer rows indenting the border of the fenestrules, so much so, that the margins are plainly visible from the non-poriferous side, giving a somewhat serrate appearance to the margin, alternating and forming oblique, transverse rows; the longitudinal rows are separated by a fine, slightly elevated carina; the space between the apertures, longitudinally, has sometimes a single striation.

Where fragments of this species occur, from the large branches, and the widening below the bifurcations, which, when the branches are broken off a short distance above, present a clavate appearance, they very much resemble a *Thamniscus*, this is especially the case where the depressed dissepiments of the poriferous side are covered with sediment, while the branches are not; without a critical examination it would be considered a *Thamniscus*.

This species can be distinguished from *F. multiplex* by its more robust form, and the greater number of ranges of cell apertures.

Formation and locality. Hamilton group; Ontario, Canada.

FENESTELLA FISTULATA, *n. sp.*

Bryozoan, broadly infundibuliform or cup shaped.

Branches slender, gradually increasing in size to the bifurcations; bifurcations distant from five to ten millimetres; diameter of branch just below bifurcation a little less than .5 mm., above bifurcation, .33 mm.; the distance between branches is less than the width, or about .25 mm.; from nine to eleven branches in the space of five millimetres; on non-poriferous side branches slightly angular, and having along the middle a narrow, slightly elevated carina or keel, which connects with similar carinae on the dissepiments; when the dissepiments or opposite ends of the branch alternate, the carina of the branch, in order to connect with the carina of the dissepiments, assumes a zigzag form, and also surrounds the fenestrules with a hexagonal elevation. There is no evidence of striae or of nodes.

Dissepiments comparatively strong, .25 mm. in width, expanding at the junction with the branches, depressed on both poriferous and non-poriferous side; on non-poriferous side, carinated and slightly angular; on poriferous side rounding.

Fenestrules small, oval; length from .33 to .50 mm., width about two-thirds the length, appearing the same size on each face of the frond.

Cells in two and three ranges, sometimes the third range extends only a short distance below the bifurcation, at others nearly the whole length to the next bifurcation; apertures, minute, circular, about .12 mm. in diameter, distant from each other less than the diameter of an aperture, twenty-five in the space of five millimetres, opening nearly directly upward; margins distinctly elevated, but on account of the apertures opening upward, scarcely indenting the border of the fenestrule ranges of apertures separated by a narrow, slightly elevated, flexuous ridge, which is shorter and more prominent when there are only two ranges of pores present.

This species is one of the most abundant of those occurring in the Hamilton group, and its poriferous face is generally easily recognized; from *F. multiplex* and *F. latitruncata* it is easily distinguished by its size and compactness.

Formation and localities. Hamilton group; Genesee and Erie counties, N. Y., and West Williams, Ontario.

FENESTELLA ASPECTUS, *n. sp.*

Bryozoan infundibuliform, undulating, frequently partially folded upon itself on a line with the branches.

Branches slender, gradually increasing in size to the bifurcations, which are distant from each other from three to fifteen millimetres; a transverse section of the branch is sub-cuneiform in outline, the widest part is on the poriferous side; just below the bifurcation on the poriferous side the branch is about .5 mm. in width, gradually growing smaller to the non-poriferous face, where it is less than half that width; just above bifurcation on poriferous side the branch is .33 mm.

in width; ten branches in the space of five millimetres; on non-poriferous side the branches are rounded or circular, and frequently have a very narrow, slightly elevated keel or striation running along the middle, which connects with a similar keel on the dissepiments, and opposite each dissepiment is a prominent triangular node.

Dissepiments slender, about .25 mm. in diameter, eight or nine in the space of five millimetres, much expanded at their junction with the branches; on non-poriferous side depressed, and with a thin, slightly elevated carina; on the poriferous side they are scarcely perceptible.

On account of the cuneiform shape of the branches, the fenestrules on the different faces of the frond have an entirely different appearance; on the non-poriferous side the fenestrules appear broadly oval, or nearly circular, a little less than .5 mm. in length and of about the same width; the branches rapidly thicken to the poriferous side where they are contiguous or nearly so, the fenestrule generally not showing at all, and when showing appearing only as a narrow slit.

Cells in two or three ranges, two ranges occur for only a short distance above the bifurcation, the greater part of the branch being occupied by three ranges; apertures small, circular, about .16 mm. in diameter, closely arranged, frequently nearly contiguous, twenty-eight in the space of five millimetres, the central row opening directly upward, the two outer rows nearly upward, slightly lateral; margins distinctly elevated and unusually thick; the margins of the outer rows of adjacent branches are separated only by a narrow line, sometimes contiguous; the central row of apertures is elevated above the outer rows, making the branch angular.

This species is not common, and when the poriferous face is seen is easily recognized; like *F. fistulata*, the cells are arranged in two and three rows and the branches are nearly of the same size, but it differs in having the cell apertures larger and much more closely arranged, and the central row much elevated, making the branch angular, while in that species the branch is nearly if not quite flat, the apertures being on the same plane; the contiguity of the branches, or the poriferous face, is also a distinguishing characteristic.

Formation and locality. Hamilton group; Bellona, New York.

FENESTELLA ANGUSTATA, *n. sp.*

Bryozoan infundibuliform; fronds large.

Branches of nearly the same size throughout their entire length, except immediately below the bifurcations, or increasing in size very gradually; bifurcations at very irregular distances from each other, varying from five to fifteen millimetres; width of branches from .33 to .50 mm.; distance apart less than the width of the branches; from ten to thirteen branches in the space of five millimetres; on non-poriferous side the branches are rounded, with generally a single range of nodes along the middle; sometimes there are additional scattering nodes with indistinct evidences of striations; on other parts of the frond the nodes are obsolete, either from wearing or some other cause not apparent, and there are from three to five strong striations on a branch.

Dissepiments comparatively strong, about .25 mm. in diameter, expanding at their junction with the branches, nine or ten in the space of five millimetres; on non-poriferous side rounded, nearly on a plane with the branches, granulose; on poriferous side depressed slightly below the ranges of apertures.

Fenestrules on non-poriferous side broadly oval, appearing narrower on poriferous side; length about .5 mm.; width from one-half to two-thirds the length.

Cells in two ranges, opening at an angle of forty-five degrees from the axis of the branch; apertures small, circular, about .14 mm. in diameter; distance apart less than the diameter of an aperture, twenty-eight to thirty in the space of five millimetres; apertures distinctly elevated and indenting the border of the fenestrules; space between the ranges of apertures carinated; carina sharp, slightly elevated, and having prominent nodes or short spines, four in the space of one millimetre.

To the poriferous side of *F. fistulata* this species has no resemblance; it slightly resembles the non-poriferous side, from which, however, it is readily distinguished by the absence of the keel along the middle of the branch and on the dissepiments, and by the presence of striations, nodes and granules.

Formation and locality. Hamilton group; Alden, Erie Co., N. Y.

FENESTELLA MARCIDA, *n. sp.*

Bryozoan, consisting of large infundibuliform fronds, frequently undulating or partially folding upon itself along the line of the branches. Branches slender, very gradually enlarging to the bifurcations, which are distant from each other from seven to twenty-four millimetres; width below bifurcation .33 mm.; width just above bifurcation .25 mm.; distance from each other equal to or a little more than the width of the branches, sometimes appearing less on poriferous side than on non-poriferous; on non-poriferous side branches rounded, except just below bifurcation, where they are flattened, striated; striæ fine but distinct, finely granulose, from three to five on a branch.

Dissepiments about .20 mm. wide, eight in the space of five millimetres; on some fronds the width is .25 mm., nearly equal in width to some parts of the branches, expanding slightly at their junction with the branches; on non-poriferous side depressed, striated; striæ granulose; on poriferous side slightly depressed, rounding, carinated; carina very thin, slightly elevated.

Fenestrules broadly oval, occasionally subquadrangular; length nearly .5 mm.; width two-thirds the length; on poriferous side the fenestrules appear narrower, the width often not more than one-third the length and sometimes appearing only as a narrow slit.

Cells in two ranges, apertures small, circular; diameter about one-seventh of one millimetre; distant from each other less than the diameter of an aperture, seven to eight in the space of five millimetres; margins distinctly elevated and indenting the border of the fenestrule; space between ranges of apertures carinated; carina spinulose; nodes

or spines prominent, about .16 mm. in height, three in the space of one millimetre.

This is a very abundant species; it is very similar to *F. angustata*, but is of less compact growth; the non-poriferous side is very finely granulose, while that species has a line of comparatively strong nodes along the middle of the branch.

Formation and localities. Hamilton group; Darien and Moscow. N. Y.

FENESTELLA PLANIRAMOSA, n. sp.

Bryozoan fan-shaped, no perfect frond observed; largest fragment seen five centimetres long and four wide.

Branches slender, bifurcations at very irregular distances from each other, varying from four to twenty-five millimetres; the branches just below bifurcation are of the same width, so that where the bifurcations are close together the branches increase rapidly in width, where they are distant they increase very gradually; branches just above bifurcation .33 mm. in width; just below, .66 mm. in width. The space between the branches is greater than their width; from four to seven branches in the space of five millimetres; on non-poriferous side, just above the bifurcation, the branch is rounded, sometimes slightly angular, soon becoming flattened, and for the greater part of the length flat or slightly concave; striated; striae very fine but distinct, from four to nine on a branch.

Dissepiments extremely slender, about .20 mm. in width; distance from each other variable, from two to four millimetres, generally a little over three millimetres, not expanding at their junction with the branches, frequently curving; on non-poriferous side often arching, striated, rounding.

Fenestrules quadrangular; length variable but usually slightly less than three millimetres; width varying from .50 to .66 mm.

Cell apertures in two and three ranges, two for the greater part of the length of the branch; apertures small, oval or circular, opening obliquely; about .20 mm. in length; distance apart varying from about two-thirds to a little more than the diameter of an aperture, from twelve to eighteen in the space of five millimetres; margin of the lower portion of aperture elevated more than that of the upper portion; space between the ranges of pores occupied by a carina; carina sharp, elevated one-fifth of one millimetre, and having prominent nodes or spines which are elevated above the carina equal to the height of the carina; three in the space of two millimetres.

Formation and locality. Hamilton group; Bellona, Yates Co., N. Y.

FENESTELLA CINCTUTA, n. sp.

Bryozoan occurring only in fragments; the form of a perfect frond is not known; one fragment, the largest seen, is somewhat curved as if forming part of a frond infundibuliform in shape, but one of the edges of the fragment is entire, rounded, and non-celluliferous, which

shows that the frond could not have been continuous; the largest fragment observed is three and one-half centimetres long and two and one-half wide.

Branches comparatively strong, increasing in size but slightly, if any, below bifurcations; width of branch .66 mm.; branches flexuous, regularly bent from side to side, forming on each side of the branch convexities and concavities, which alternate with each other, the convexities of contiguous branches uniting and coalescing; on non-poriferous side the branches are slightly angular, with a carina running along the middle; the carinæ of two contiguous branches, at the anastomosed part, sometimes unite and form on that portion one carina, at other times there is a space of .25 mm. or more, which is deeply channelled.

Dissepiments or anastomosed portions of the branch vary in width from .66 mm. to 1.33 mm.; the narrower ones are in reality not anastomosing, but very short celluliferous dissepiments; there are three in the space of five millimetres.

Fenestrules oval, one millimetre in length, .66 mm. in width.

Cells in three ranges; on the dissepiments sometimes one or two ranges more; apertures minute, circular, a little more than .20 mm. in diameter, closely arranged, frequently nearly contiguous, eighteen in the space of five millimetres; the central range opens directly upward, the outer range nearly directly upward, very slightly laterally; margins comparatively strong, very distinctly elevated.

Formation and locality. Hamilton group; Ontario, Canada.

FENESTELLA PERUNDULATA, *n. sp.*

Bryozoan probably infundibuliform in shape.

Branches moderately strong, .5 mm. in width; space between the branches more than the width of the branches, seven branches in the space of five millimetres; on non-poriferous side angular, carinated; carina and upper part of the branch regularly flexuous; at the dissepiments the carina and angular portion of the branches frequently meet and coalesce, giving the appearance of anastomosing branches.

Dissepiments strong, from .50 to .66 mm. in width, expanding at their junction with the branches, about three in the space of five millimetres; on non-poriferous side, angular and on a plane with the branches; on poriferous side depressed, rounding.

Fenestrules small, oval, .75 mm. in length, .5 mm. in width.

Cells in two ranges; apertures small, circular, opening nearly directly upward, about .16 mm. in diameter, distance apart less than the diameter of an aperture, about twenty in the space of five millimetres; margins distinctly elevated; space between ranges of apertures carinated; carina strong, with an elevation equal to the thickness of a branch, and slightly expanded and flattened at the top; width of expanded portion .25 mm.; finely striated.

On the poriferous face the branches, carinations and ranges of apertures are straight, presenting a somewhat rigid appearance, while on the non-poriferous face the whole upper portion of the branch is regu-

larly flexuous. Sometimes, on the dissepiments, the carinations meet, coalesce, and form a carination across the dissepiments; at others there is a space between of .25 mm.; sometimes this space is smooth and deeply channeled across the dissepiment, at others the dissepiment has a carina connecting the carinae of the adjacent branches; the two faces present such a different appearance, that were it not for the fact that both sides of the same specimens are seen they would be very easily mistaken for different species.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA ASSITA, *n. sp.*

Bryozoan probably infundibuliform, though occurring only in fragments in the present collections; largest fragment observed two and one-half centimetres long, two centimetres wide.

Branches moderately strong, gradually enlarging in size to the bifurcations, which are distant from each other from three to fourteen millimetres; width of branches on non-poriferous side .33 mm., on poriferous side about .50 mm.; space between branches less than the width of the branches, ten branches in the space of five millimetres; on non-poriferous side branches rounding, carinated; carina thin, elevated about .20 mm., and obscurely nodose.

Dissepiments strong, .33 mm. in width, eight in the space of five millimetres, expanding at their junction with the branches; on non-poriferous side, on a plane with the branches, carinated; on poriferous side depressed, carinated.

Fenestrules oval, about .33 mm. in length; width on non-poriferous side about two-thirds the length; on poriferous side they are very obscure, either not perceptible or appearing as very narrow slits.

Cell apertures in two and three ranges; the greater part of the length of the branch has only two ranges; in a branch which is eleven millimetres long before bifurcating, eight millimetres of that length has two ranges of cells, and three millimetres three ranges; apertures small, circular, opening directly upward, about .16 mm. in diameter; distance between apertures less than the diameter of an aperture, twenty apertures in the space of five millimetres; margins distinctly elevated; space between ranges of apertures carinated; carina strong, not much elevated, and having minute spines situated at quite regular distances from each other, about twenty in the space of five millimetres; the ranges of apertures on adjacent branches are nearly contiguous.

Formation and locality. Hamilton group; New York.

FENESTELLA INFLEXA, *n. sp.*

Bryozoan infundibuliform; fronds large, largest fragments seen seven millimetres across.

Branches flexuous, forming on each side of a branch regular and alternate convexities and concavities; the convexities of the opposite

side of adjacent branches frequently contiguous; coalescing; bifurcations distant from each other from two to ten centimetres or even more; width of branch .5 mm., eight in the space of five millimetres; on non-poriferous side the branches are angular and carinated; where two branches or the carinations of two branches unite there is very frequently a small spine or node.

Dissepiments or points of anastomosing about .66 mm. wide, four in the space of five millimetres; sometimes the branches simply anastomose; at other times there is a short dissepiment.

Fenestrules small, oval, .66 mm. in length; width about one-half the length. On the poriferous side the branches are angular.

Cells in two ranges, opening nearly directly upward, apertures minute, circular, about .20 mm. in diameter, closely arranged; distance between apertures less than the diameter of an aperture; sometimes nearly contiguous, eighteen in the space of five millimetres; margins distinctly elevated; space between ranges of apertures angular, carinated; carina sharp, sinuous, elevated about .20 mm.

The non-poriferous face presents a variety of phases; sometimes the carinae of adjacent branches unite and immediately separate, leaving the point of union merely a point which generally has a node or spine, and presents the appearance of a diamond-shaped elevation inclosing the fenestrule, sometimes they remain united for the space of half a millimetre or more, at other times they do not meet and the space between is sometimes channeled, and at others there is a transverse carination, connecting the two longitudinal carinations. This latter form occurs where the branches are united by dissepiments instead of anastomosing, and presents the appearance of an hexagonal elevation inclosing the fenestrule.

This species is very similar to *F. perundulata* on the non-poriferous face and without very critical comparison it would be difficult to distinguish them; but on the poriferous face the difference is more evident. In this species the carina separating the row of apertures is thin, sharp, highly elevated and very sinuous. In *F. perundulata*, it is strong, elevated equal to the thickness of the branch expanded at the top, and straight.

Formation and locality. Hamilton group; West Bloomfield, New York.

FENESTELLA PERFORATA, *n. sp.*

Bryozoan consisting of large infundibuliform fronds; fragments are of six centimetres in length and five in breadth, evidently only a small portion of the frond; thickness of frond one and one-half millimetres; frond consisting of numerous cylindrical branches which frequently and irregularly bifurcate, and are connected by dissepiments; along the middle of the branches and dissepiments on the celluliferous face there is a keel or carina, which is elevated and expands above, forming secondary branches and dissepiments very similar in appearance to the principal ones.

Branches moderately strong, about .5 mm. in width, eight branches in the space of five millimetres; branches regularly sinuous, forming

on each side of the branch regularly alternating curvatures and concavities; the convexities of adjacent branches approach each other, but very seldom unite, being connected by dissepiments; on non-poriferous side the branches are rounding or slightly angular and have along the middle a carina; carina thin, slightly elevated and connected with similar carinæ on the dissepiments.

Dissepiments strong, of about the same width as the branches, five in the space of five millimetres; on non-poriferous side on the same plane as the branches; rounded or slightly angular; carinated; carina thin, slightly elevated and connected with the carinæ of the branches.

Fenestrules small, oval, slightly more than .5 mm. in length; width two-thirds to three-fourths the length.

Cells in two ranges, opening directly upward; apertures minute, nearly circular, about one-sixth or one-seventh of one millimetre in diameter, closely arranged, distance apart less than the diameter of an aperture, occupying the dissepiments as well as the branches, and forming an oval arrangement; the margins are distinctly elevated and indent the borders of the fenestrules; the space between the apertures both on the branches and dissepiments is carinated; carina thin and elevated about the thickness of the branch, when it expands and forms secondary non-celluliferous branches and dissepiments; branches .33 mm. in width, round, and having a carina; carina thin, but slightly elevated, though very distinct; branches regularly sinuous; dissepiments of the same width as the branches, round, carinated; carina similar to and connected with those of the branches.

Fenestrules oval or circular; the circular form has a diameter of about .66 mm.; the oval forms are .66 mm. (sometimes a little more) in length and about .5 mm. in width.

The two faces of the frond are very similar in appearance, the principal branches being a little wider than the secondary ones; the sinuosity of the branches and the connecting carinæ of the branches and dissepiments present the appearance of fenestrules enclosed by a hexagonal angular elevation; the dissepiments being of the same width as the branches on the same plane and similarly carinated, and the branches being quite irregular, it is sometimes very difficult to distinguish them.

Formation and locality. Hamilton group; New York.

FENESTELLA SCALARIS, *n. sp.*

Bryozoan consisting of large infundibuliform fronds; largest fragment seen seven centimetres long and nearly four centimetres wide.

Branches slender, very gradually increasing in size to the bifurcations, which are distant from each other from five to thirty millimetres, generally from fifteen to twenty millimetres; width of branches about .33 mm.; distance between branches less than the width of the branches, from nine to eleven branches in the space of five millimetres; on non-poriferous side branches rounded, carinated; carina slightly elevated and finely nodose, about seven nodes in the space of one millimetre; on some fronds the nodes are more distant, and the rest of the branch is granulose.

Dissepiments comparatively slender, less than .25 mm. in width, six in the space of five millimetres; on non-poriferous side, on a plane with the branches, rounded, carinated; carina similar to the carina of the branch.

Fenestrules oval, length about .66 mm., width from one-half to two-thirds the length.

Cells in two ranges, opening nearly directly upward; apertures minute, circular, about .20 mm. in diameter, distance apart equal to and slightly more than the diameter of an aperture, about twenty in the space of five millimetres; margins slightly elevated, and indenting the border of the fenestrule; space between the ranges of apertures elevated, carinated; carina thin, elevated, nearly equal to the thickness of the branch, the upper half slightly expanded, and having a sharp, thin crest, the carinæ connected by their lateral projections or bars, which are very thin and extend down the side of the carinæ obliquely about .20 mm., or a little more, about eighteen bars in the space of five millimetres.

Where the poriferous face is seen this species can be easily distinguished by the very thin lateral bars connecting the carinæ, and their comparatively great distance apart. The species of the genus *Fenestella* are so similar in appearance, that without both poriferous and non-poriferous faces, it is sometimes very difficult to assign a specimen to the right species.

Formation and localities. Hamilton group; Bellona, N. Y., and West Williams, Ontario.

FENESTELLA EXORNATA, *n. sp.*

Bryozoan probably infundibuliform, though occurring only in fragments in the present collections; largest fragment seen five centimetres long and three wide.

Branches moderately slender, appearing more slender on non-poriferous side than on poriferous, gradually increasing in size to the bifurcations, which are distant from each other generally from five to seven millimetres; branches from .33 to .50 mm. in width; space between the branches on non-poriferous side more than the width of branches, on poriferous side about equal to the width, five or six branches in the space of five millimetres; on non-poriferous side flat, with a comparatively thin, sharp elevation around the edge of the fenestrules; the space between these elevations flat or slightly concave, with frequent, short, broad, conical spines, about .20 mm. in height.

Dissepiments strong, frequently as wide as, or wider than the branches, there are four in the space of five millimetres, greatly expanding at their junction with the branches, on a plane, and having the same appearance in every respect as the branches on their non-poriferous side; on poriferous side very much depressed and flattened.

Fenestrules, on non-poriferous side, appearing broadly oval, on poriferous side elongate-oval; length from three-fourths to one millimetre; width on poriferous side .5 mm.

Cells in two ranges, opening slightly laterally; apertures small, circular; diameter about .16 mm.; distance apart equal to or a little more than the diameter of an aperture, about twenty in the space of five millimetres; margins slightly elevated; space between the rows of apertures carinated; carina thin, sharp, consisting of two plates, which coalesce near the crest; height of carina .75 mm., or nearly twice the width of the branches.

This species is very characteristic and is easily recognized from either surface, from non-poriferous by the flat branches, with elevation around the fenestrule; and from the poriferous face by the thin greatly elevated carina, in which respects it differs from any other known species of this formation.

Formation and locality. Hamilton group; Alden, Erie county, N. Y.

FENESTELLA QUADRANGULA, *n. sp.*

Bryozoan probably infundibuliform in shape though, so far as observed, occurring only in small fragments; frond rigid in appearance.

Branches slender, very gradually increasing in size to the bifurcations which are distant from each other from five to fifteen millimetres, generally from ten to twelve millimetres; width of branches from .33 to nearly .50 mm. space between the branches more than the width of the branches; nine branches in the space of five millimetres; on non-poriferous side, branches rounded and frequently having a node or spine opposite the dissepiments; striated; striæ fine; sometimes entirely concealed by fine granules.

Dissepiments slender, less than .25 mm. in width; seven in the space of five millimetres, expanding at their junction with the branches; on non-poriferous side on a plane with the branches, rounding; poriferous side depressed, angular; slightly carinated.

Fenestrules broadly oval or sub-quadrangular; length from .50 to .66 mm.; width from .33 to .50 mm. Cells are in two ranges, opening slightly laterally; apertures minute, .16 mm. in diameter, very closely arranged; distance apart about one-half the diameter of an aperture; twenty-two in the space of five millimetres; margins slightly elevated; space between ranges of apertures, angular, carinated; carina moderately strong; very slightly elevated and having a row of nodes; nodes moderately strong, about four in the space of one millimetre.

Formation and locality. Hamilton group; Darien, N. Y.

FENESTELLA EMACIATA, *n. sp.*

Bryozoan occurring only in fragments, the form of the whole frond is not certainly known, but probably infundibuliform; largest fragment observed five centimetres long and three wide.

Branches moderately slender; not increasing in size, except just below the bifurcations, which are distant from each other from four to twenty-four millimetres — generally about fifteen millimetres; width

of branches from .33 to .50 mm.; space between about equal to the width of the branches; seven branches in the space of five millimetres; on non-poriferous side, rounded, striated; striæ moderately strong, from three to five on a branch; finely granulose; sometimes the central stria resembles a narrow carina.

Dissepiments about .25 mm. in width; six in the space of five millimetres; slightly expanding at their junction with and oblique to the branches; angle of obliquity from ten to twenty degrees; on non-poriferous side moderately depressed, rounded, transversely striated, granulose; on poriferous side, very much depressed, slightly angular, carinated; carina slight.

Fenestrules oval or subquadrangular; length .66 mm.; width from .33 to .50 mm.

Cells in two ranges opening laterally; apertures small, .20 or .16 mm. in diameter, closely arranged, frequently nearly contiguous; from twenty to twenty-five in the space of five millimetres; margins elevated and indenting the border of the fenestrule.

Space between the ranges of apertures elevated, height equal to one-half the thickness of the top of the branch; slightly rounding; not acutely angular, having a row of nodes; nodes minute; frequently wanting.

This species differs from *F. marcida* by having stronger, more widely separated branches; dissepiments farther apart and oblique to the branches; on the poriferous side the cells open more laterally; the space between the cells is elevated, not carinated, and comparatively thick, and without the closely arranged, prominent nodes of that species.

Formation and locality. Hamilton group, shore of Seneca lake, N. Y.

FENESTELLA CURVATA, *n. sp.*

Bryozoan infundibuliform; largest fragments seen four millimetres in length and of about the same width.

Branches slender, scarcely increasing in size to the bifurcations, which are distant from each other from four to fifteen millimetres, generally about ten millimetres; width of branches from a little less than .25 to .33 mm., occasionally slightly more; transverse section sub-cuneiform in outline; space between branches greater than the width of the branches; seven branches in the space of five millimetres; when the dissepiments on opposite sides of the branches alternate, the branch is flexuous, but not when the dissepiments are opposite each other; on non-poriferous side the branches are rounder, in well-preserved specimens showing fine, granulose striæ, from five to seven on a branch; generally opposite the dissepiments there is a prominent, conical spine about .25 mm. in height.

Dissepiments comparatively strong; width nearly or quite equal to that of the branches; thirteen in the space of ten millimetres; not expanding at their junction with the branches; on non-poriferous side slightly depressed, rounding; on poriferous side scarcely perceptible.

Owing to the sub-cuneiform shape of the branches the fenestrules of the poriferous and non-poriferous face present an entirely different appearance; on non-poriferous face they are broadly oval or sub-quadrangular; .66 mm. in length; width from .50 to .66 mm.; on the poriferous side they frequently appear merely as narrow slits; sometimes the branches are apparently contiguous.

Cells in two ranges, opening slightly laterally; apertures minute, circular, diameter about .20 mm., closely arranged; distance apart from one-half to one diameter of an aperture, about twenty in the space of five millimetres; margin distinctly elevated and indenting the border of the fenestrule; space between ranges of apertures carinated; carina thin, slightly elevated and having prominent nodes or short spines, two in the space of one millimetre.

When both the poriferous and non-poriferous faces of this species can be seen, it will be very easily distinguished from any other species of this formation.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA BREVILINEA, *n. sp*

Bryozoan probably infundibuliform, largest fragment seen seven centimetres wide and five long.

Branches moderately strong, a transverse section sub-cuneiform in outline—the widest portion on poriferous side—gradually increasing in size to the bifurcations, which are distant from each other from seven to twenty millimetres; width of branches from .33 to .66 mm.; space between branches greater than the width of the branches, five or six in the space of five millimetres; or when the dissepiments on opposite sides of the branches alternate, which is generally the case, the branches are sinuous; on non-poriferous side rounding or slightly angular, carinated; carina thin, but slightly elevated, sinuous; surface pustulose.

Dissepiments from .50 to .66 mm. in width, three in the space of five millimetres on non-poriferous side, on a plane with the branches, rounded, with a semi-circular carination; pustulose.

Fenestrules oval; owing to the sub-cuneiform shape of the branches, the fenestrules on poriferous and non-poriferous sides present a widely different appearance; on non-poriferous side 1.33 mm. in length, .50 mm. or slightly more in width; on poriferous side they appear much smaller, both in regard to length and width.

Cells in two ranges minute, circular or lunate, opening slightly laterally; diameter .20 or .16 mm.; space between the apertures longitudinally, equal to or more than the diameter of an aperture; ranges of apertures separated by a carina, which is very much elevated; height about .75 mm., or more than the thickness of the branch; at the base it is nearly .25 mm. in thickness, continuing of that thickness for about one-third the height of the carina, where it abruptly narrows and for the rest of the height the carina is extremely thin. Owing to the sudden contraction of the carina it appears to have a ridge upon the side when viewed from above; apparently the dissepiments sometimes have

a similar ridge; though not invariably, as the specimens, so far as observed, never occur with the poriferous face free, and the carina being extremely thin, so that in separating from the rock it might possibly be that the carinæ of the dissepiments, if any exist, are broken. The non-poriferous face, on different portions of the frond, presents a variety of appearances; on some portions apparently the branches have a continuous carina very thin and but slightly elevated and the dissepiments with a semi-circular carina, not connecting with the carina of the branch; on other portions the fenestrules are surrounded by thin elevations, the space between being somewhat flattened and in the wider portions having slightly elevated irregular lines and in the narrower portions pustulose.

This species can be distinguished from *F. exornata* by its coarser appearance as well as by the different ornamentation of the non-poriferous face of the branches.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA SUBTORTILIS, *n. sp.*

Probably infundibuliform in shape, but occurring only in fragments; largest fragment observed three centimetres long and two and one-half in diameter.

Branches comparatively slender, of nearly the same width throughout their entire length; bifurcations distant; width of branches from .25 to a little more than .33 mm.; space between equal to or a little more than the width of the branches; nine branches in the space of five millimetres; where the dissepiments on opposite sides of the branches alternate, which is generally the case, the branch is regularly flexuous; on non-poriferous side the branches are moderately convex, and with a thin, slightly elevated carina running along the middle which is frequently obliterated by weathering; the carina is finely nodose, the rest of the branch is also nodose or granulose; branches wider on poriferous side, giving the appearance of being more densely arranged than on the non-poriferous side.

Dissepiments strong, as wide or wider than the branches, six in the space of five millimetres; on non-poriferous side, on a plane with or elevated slightly above the branches, rounded, carinated; carina thin, slightly elevated and connecting with the carinæ of the branches; on poriferous side depressed, narrower than on the non-poriferous side.

Owing to the branches being widest on the poriferous side, the appearance of the fenestrules on the poriferous face varies from that of the non-poriferous side; on which side they are broadly oval or circular; length about .5 mm.; width from three-fourths to equal the length; on poriferous side they appear much narrower, the branches sometimes being nearly contiguous.

Cells in two ranges; opening directly upward; apertures minute, circular, about .20 or .16 mm. in diameter; distance apart equal to or less than the diameter of an aperture, eighteen in the space of five millimetres; margins thin, elevated; space between ranges of apertures carinated; carina at first very thin, sinuous, thickening immediately

to about .25 mm., and having on top a thin, very slightly elevated crest. This species, especially on poriferous side, has some resemblance to *F. perundulata*, but is a much finer frond; the non-poriferous face resembles *F. curvata*, but the branches are stronger, more compactly arranged, and without spines or prominent nodes; the poriferous side is very dissimilar.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA STRATA, n. sp.

Bryozoan infundibuliform; largest fragment observed five centimetres long and three wide.

Branches moderately strong; widest on the poriferous side, where they are .5 mm. in width; on non-poriferous side about .25 mm.; extremely sinuous, forming at the sides of the branch alternating and regular convexities and concavities; the convexities of adjacent branches touching and coalescing; on poriferous side the branches are angular, having a slight keel, which is conspicuously nodose, owing to that side of the branch being the narrowest and the angular tops of the branches coalescing; the sinuosity of the branches is much greater on the non-poriferous side, forming diamond-shaped elevations; the frond presenting a reticulated appearance, and it is with great difficulty that the direction of the branches can be determined.

Dissepiments; the points of coalition or anastomosing are in width equal to or a little more than that of the branches; four in the space of five millimetres.

Fenestrules on non-poriferous side oval, sometimes nearly circular, usually about one millimetre in length; width two-thirds to three-fourths the length; the size and shape, however, are somewhat variable; on non-poriferous side appearing much smaller both as regards length and breadth; the branches on poriferous side, though sinuous, present a much straighter appearance than on the non-poriferous side.

Cells in two ranges, opening directly upward or slightly laterally, minute, circular; .14 mm., or a little less, in diameter; distance apart more than the diameter of an aperture, about eighteen in the space of five millimetres; margins thin, distinctly elevated; space between the ranges of apertures carinated; carina moderately thin, elevated about .20 mm., sinuous and finely crenulate.

This species in its sinuous, anastomosing branches resembles *F. inflexa*, but the branches are more slender, and on the non-poriferous side it has two ranges of apertures, divided by a carina, while that species has three or more ranges without carina. In *F. perundulata* the frond on non-poriferous face has a much more irregular appearance, and is more decidedly anastomosing.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

ON THE STRUCTURE OF THE SHELL IN THE GENUS ORTHIS.

BY JAMES HALL.

It is generally pretty well known among palæontologists, at the present time, that the genus ORTHIS, as constituted by Dalman, contains heterogeneous material; and that the species do not form the well characterized natural group sometimes claimed for them.

Leaving out of consideration the two species first named by the author of the genus, which are marked with an ?, the remaining species exhibit a considerable variety of external form and of internal marking, which characters alone are sufficient to distinguish them generally from one another.

The general aspect of the shells constituting the genus, as described by its author and extended by subsequent writers, is a sub-circular or sub-quadrate form; valves sometimes nearly equally convex, while in other examples one valve may be flat or concave. This latter feature may affect either the ventral or the dorsal valve. Both valves are furnished with an area, though this character is often but slightly developed in the dorsal valve; the opposite valve is furnished with wider area and open triangular fissure for the passage of a pedicil. The hinge line is straight, usually shorter than the width of the shell. The surface is striated or plicated, and the general aspect of nearly all the forms is so similar that they have been grouped together, generally, and by the best authors, without hesitation.

The most conspicuous external difference is between a finely striated, and a coarsely plicate surface. These differences are often accompanied by another distinguishing feature. The coarsely plicate forms, among the American species, are usually what are termed *resupinate shells*; the dorsal valve being the more convex and the ventral valve flat or concave and sometimes sinuate in front, but still carrying its conspicuous area and foramen. On further examination we find that many striated species are resupinate, or have the dorsal valve the more convex. An examination of the interior of the shell in all these forms shows that the muscular impression in the ventral valve is strongly defined, distinctly bilobate, limited at the margins by a strong ridge or elevated lamella, usually interrupted or non-continuous in the front. (These forms are chiefly of lower or middle Silurian in their geological range.)

On comparing other forms of the genus where the valves are nearly equal, or where the shell is plano-convex, the more convex valve is the

ventral. There are also resupinate forms which are closely allied to them; but, as a rule, the forms with finely striated surface, subequivalve or plano-convex, have the ventral valve the more convex; and the muscular impression is flabelliform with its margins lobed, and more or less distinctly limited by an elevation of the interior substance of the shell.

The resupinate forms which are more closely allied to those with flabelliform ventral muscular impressions, have the corresponding muscular imprint more strongly defined and less distinctly lobed at the margins than in the forms just noticed.

These are the most obvious distinctions among the prevailing forms of the genus *ORTHIS* as constituted by Dalman.

The *Orthis* (*Platystrophia biforata*) is, in some degree, an exception to all the forms above mentioned, having both valves very convex, the surface strongly plicated, with a mesial fold and sinus, as in *SPIRIFERA*. In its muscular areas it resembles the resupinate forms of *ORTHIS* of the lower Silurian rocks, often presenting an abnormal thickening of the shell around the muscular area of the ventral valve.

The *Orthis biloba* (*Dicælosia biloba* of King) of the upper Silurian rock also presents a departure from the typical forms of *Orthis*, but preserves the similar muscular system.

Before undertaking a revision of the materials constituting the genus *ORTHIS*, it has seemed desirable to ascertain whether the variations in form, surface ornamentation, or character of muscular impression, is associated with any difference in the shell-structure. For this purpose, cuttings, prepared for microscopic examination, have been made from many species, and the result has proved that all the resupinate lower and middle Silurian forms, whether plicate or finely striate, are fibrous shells, with the ventral muscular impression small and strongly limited. They are essentially either free from punctæ in any form, or with a few scattered pustuliform pores. The finely striate sub-equivalve or plano-convex forms with flabelliform muscular impressions, have the shell punctate in lines, or radiating belts, corresponding to the rays of the shell, with an intermediate fibrous texture. The character of the punctæ, the strength and comparative width of the punctate bands, vary with the different species.

In the finely striated, resupinate forms of the Lower Helderberg, Hamilton and Chemung groups, with the smaller and more distinctly limited flabelliform ventral muscular areas, the punctate character is very marked, often occupying almost the entire surface, and the lines of the radii are shown only by a more crowded condition of the punctæ. The resupinate species here referred to are quite different in their outline and general form from those of the lower rocks, being for the most part rotund forms with the cardinal extremities rounded. These species are easily recognized, and readily distinguished from those of the preceding group by their external form alone.

The numerous species which have been already studied in their microscopic shell-structure are naturally separated into three distinct groups which may be of generic value.

The first group includes the coarsely plicate forms, with extended cardinal angles; the valves resupinate or normal in their relations; the test is coarsely fibrous, and usually without punctæ, although some

species occasionally show a few large scattered pores or ducts near the front of the shell.

Professor King has proposed the name *PLATYSTROPHIA* for *Orthis biforata*, and this species in its fibrous and non-punctate texture, may be taken as characteristic of the first group, although there are some features, especially in the form of the shell and also in the muscular impressions, which do not in every respect agree with other members.

With our present knowledge, we may include in this group the following species:

Platystrophia biforata, Trenton and Hudson River groups.

“ *tricenaria*, “ “ “ “

“ *subquadrata*, Hudson River group.

“ *borealis*, “ “

“ *occidentalis*, “ “

“ *plicatella*, “ “

“ *flabella*,* Niagara group.

This list will be greatly extended as soon as the shell-structure of allied species can be studied. At present only those species are included which have been studied under the microscope.

The second group embraces forms which are usually regarded as typical species of the genus *ORTHIS*. The shell-structure characterizing this group may be described as finely fibrous, with distinct rows of punctæ coming out along the summit of the radii; the rows of punctæ are simple, or double in some species (*O. Clytie*), but usually there are several rows to each ray.

The following species of this group have been microscopically studied in numerous specimens:

Orthis testudinaria, Trenton and Hudson River groups.

“ *perveta*, “ “ “ “

“ *Clytie*, Hudson River group.

“ *elegantula*, Niagara group.

“ *hybrida*, “ “

“ *Vanuxemi*, Hamilton group.

“ *Penelope*, “ “

The third group, consisting of *O. multistriata* of the Lower Helderberg group, *O. Iowensis* of the Hamilton group, *O. Tulliensis* of the Tully Limestone, and *O. impressa* of the Chemung group, is highly punctate, with a fine fibrous texture of the shell-substance. In the great number of the punctæ and for the most part their uniform character, together with their arrangement, these forms of the *Orthida* resemble species of *Terebratula*, *Cyrtina*, etc. The name *Schizophoria*, King, may be adopted for this latter group of species.

The accompanying illustrations (plates 3 and 4) will serve to give a clear idea of the microscopic characters presented in the shell-structure of specimens in each of the three groups indicated.

The preparation of the shell sections and the photographs of these for the lithographer have been made by Mr. C. E. Beecher of the State Museum.

*Not *Orthis flabella* of Sowerly.

DESCRIPTION OF A NEW SPECIES OF STYLONURUS FROM THE CATSKILL GROUP.

BY JAMES HALL.

Sometime during the year 1882 Prof. Geo. H. Cook of Rutgers College, State Geologist of New Jersey, called my attention to the carapace of a large crustacean in a mass of sandstone from the town of Andes, Delaware county, N. Y., which had been presented to the College Museum. At the same time Prof. Cook sent to me a plaster cast of the fossil, in relief, which preserved the characters of the surface in a remarkable degree of perfection.

I subsequently saw the original specimen in the museum of Rutgers College, and at a later period, through the kindness of the authorities of that institution, I have been allowed to have the specimens in my possession, for more critical examination and study.

The locality of the fossil is in the midst of the Catskill group, and the character of the rock alone indicates its geological horizon.

The specimens of the rock, one retaining the impression and the other the relief of the carapace, are more than two feet across, each one having a thickness of several inches. Although there are in one of the slabs some cavities partially filled with ferruginous matter, and other ferruginous markings, I have been unable to detect any evidence of organic remains in any part of the mass.

The rock, in its unweathered condition, is a fine-grained, olive-gray sandstone, weathering to a more distinctly gray color and becoming somewhat friable.

The accompanying description and illustration of the species will give an idea of the character of the fossil, and its relations to its congeners previously known.*

*The first published notice of this fossil, so far as I am aware, appeared in the Transactions of the New York Academy of Sciences (Vol. II, p. 8, Oct., 1882), by Prof. D. S. Martin, under the title of a new Eurypterid from the Catskill group. The notice was based upon a cast of the carapace in the N. Y. State Museum of Natural History, which had been labeled with name and locality by the author. The printer's error in spelling the name *Stylomurus* instead of *Stylonurus*, would be readily corrected by any one at all familiar with this class of fossils.

GENUS STYLONURUS, PAGE 1856.

STYLONURUS EXCELSIOR, *n. sp.*

Plate V, fig. 1.

Carapace sub-elliptical, truncate behind; width at the base about two-thirds of the length; lateral margins gently curved outward from the base of the carapace to a point opposite the base of the palpebral arches, thence gradually incurving to the front of the carapace.

Eyes circular situated on a line just anterior to the center of the length; separated by a strong median ridge which, commencing nearly on a line with the posterior limits of the palpebral arches extends forward nearly one-half the distance to the anterior margin where it becomes merged in the general convexity of the surface; palpebral arches strongly elevated semi-circular, more regularly curving behind, where they are gradually depressed into the general contour; the anterior portion of the arch is narrower and terminates abruptly in a line almost through the center of the eyes; posterior angles of the carapace rounded; occipital ring moderately defined, anterior to which and separated by a transverse depression, is a central lobe with an intermediate and lateral lobe on each side with corresponding depressions.

Surface on the anterior part marked by strong elongate and confluent pustules which are arranged in concentric lines, becoming more individualized and directed backward and subimbricating on the posterior half; the markings on the occipital ring are more subdued than upon the general surface, except on the posterior margin which is ornamented by a row of strong spiniform nodes; the entire intermediate surface, as well as the surface of the nodes, is marked by fine scales; the surface included by the palpebral arches is marked by stronger scales which are not elevated into nodes; the concave spaces between the posterior lobes are marked only by the fine, scale-like ornamentation.

Abdomen and appendages unknown.

The greatest length of the carapace is two hundred and fifty-five millimetres; width at base one hundred and ninety-five millimetres; width in a line through the bases of the palpebral arches two hundred and twenty-five millimetres, and across the anterior extremities of the arches one hundred and ninety-three millimetres; the diameter of the eyes is twenty-three millimetres; distance between the extremities of the palpebral arches, sixty-five millimetres.

This species is very different from the ordinary forms of the genus in the great anterior extension of the carapace and the prominence of the palpebral arches.

A restoration on the scale of *Stylonurus Logani*, Woodward, would make the entire animal over four feet in length.

Formation and locality. In the Catskill group; Andes, Delaware county, N. Y.

LIST OF SPECIES OF FOSSILS FROM AN EXPOSURE OF THE
UTICA SLATE AND ASSOCIATED ROCKS, WITHIN THE
LIMITS OF THE CITY OF ALBANY.

BY C. E. BEECHER.

Climacograptus bicornis.
Dicranograptus ramosus.
Diplograptus mucronatus.
Crinoid stems.
Trematis terminalis.
Leptaena sericea.
“ *subtenta*.
Orthis testudinaria.
Zygospira modesta.
Avicula Trentonensis.
Cleidophorus planulatus.
Ambonychia undata.
Tellinomyia dubia.
“ *levata*.
Lyrodesma poststriatum.
Ten undetermined species of *Lamellibranchiata*.
Hyolithes Americanus.
“ sp. ?
Bellerophon bilobatus.
“ *cancellatus*.
Murchisonia gracilis.
Eudoceras proteiforme.
Orthoceras bilineatum ?
Cornulites flexuosus.
Plumulites sp. ?
Triarthrus Becki.
Trinnucleus concentricus.

Thirty-six species, several of which have not heretofore been noticed in the Utica Slate.

The well-known graptolite locality at Kenwood has been for a long time the only locality for fossils in the immediate vicinity of Albany, and has afforded but a single oboloid shell in addition to the graptolites. The discovery of strata furnishing an abundant and varied fauna is, therefore, of considerable interest.

The beds carrying these fossils are nearly vertical and situated north of the Dudley Observatory on the line of the New York Central railroad.

A CATALOGUE
OF THE
PUBLISHED WORKS OF JAMES HALL. LL.D.
1836-1882.

COMMUNICATED BY DR. DAVID MURRAY.

PART I.

BOOKS.

1. Geology of New York. Part IV, comprising the survey of the Fourth Geological District; pp. 682, maps and plates. Albany, 1843. 4to.
2. Fremont's Exploring Expedition: Appendix A. Geological formations; pp. 295-303. B. Organic Remains; pp. 304-310, 4 plates. Washington, 1845. 8vo.
3. Palæontology of New York. Vol. 1; pp. xxiii, 338; plates, 100. Albany, 1847. 4to.
4. Report on the Geology of the Lake Superior Land District. By J. W. Foster and J. D. Whitney:
Lower Silurian System. Chapter 9, pp. 140-151. Washington, 1851. 8vo.
Upper Silurian and Devonian Series. Ibid. Chapter 10, pp. 152-166.
Description of New and Rare Species of Fossils from the Palæozoic Series. Ibid. Chapter 13, pp. 203-231.
Parallelism of the Palæozoic Deposits of Europe and America. Ibid. Chapter 18, pp. 235-318.
5. Stansbury's Expedition to the Great Salt Lake. Geology and Palæontology; pp. 401-414. Philadelphia, 1852. 8vo.
6. Palæontology of New York. Vol. II; pp. viii, 362; 104 plates. Albany, 1852. 4to.
7. United States and Mexican Boundary Survey (EMORY). Geology and Palæontology of the Boundary; pp. 103, 140, 20 plates. Washington, 1857. 4to. Also published in American Journal of Science, 2d Ser. See vol. 24, pp. 72-86. New Haven, 1857.
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9. Contributions to the Palæontology of Iowa, being descriptions of new species of Crinoidea and other fossils (supplement to vol. I, part II, of the Geological Report of Iowa); pp. 1-92, 3 plates. Albany, 1859.

10. Iowa Geological Survey. Supplement to vol. I, part II; pp. 1-4. 1859. 4to.
11. Palæontology of New York. Vol. III, part I, text; pp. xii, 522. Albany, 1859. 4to.
12. Supplement to Vol. 1, published in Palæontology of New York. Vol. III, pp. 495-529. Albany, 1859. 4to.
13. Palæontology of New York. Vol. III, pt. II, plates. 141 plates and explanations. Albany, 1861. 4to.
14. Report on the Geological Survey of the State of Wisconsin. Vol. I, James Hall and J. D. Whitney. Madison, 1862. 8vo.
Chapter I, Physical Geography and General Geology, pp. 1-72.
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15. Geological Survey of Canada, Figures and Descriptions of Canadian Organic Remains. Decade II. Graptolites of the Quebec Group; 151 pages, 23 plates. Montreal, 1865. 8vo. and 4to.
16. Palæontology of New York. Vol. IV, pt. I, pp. xi, 428, 69 plates. Albany, 1867. 4to.
17. Geological Survey of the State of Wisconsin, 1859-1863. Palæontology; part III. Organic Remains of the Niagara Group and Associated Limestones; pp. 1-94, 18 plates. Albany, 1871. 4to.
(Same as published in 1864 in advance for 18th Report and 20th Report, New York State Museum of Natural History, 1867, under title of "Account of Some New or Little Known Species of Fossils from Rocks of the Age of the Niagara Group," also in revised edition of same in 1870.)
18. Geological Survey of Ohio. Vol. II. Geology and Palæontology; part II, Palæontology. Columbus, 1875. 8vo.
Descriptions of Silurian Fossils, James Hall and R. P. Whitfield. Ibid., pp. 65-161.
19. Descriptions of Crinoidea from the Waverly Group, James Hall and R. P. Whitfield. Ibid., pp. 162-179.
20. Illustrations of Devonian Fossils; 7 pages, 133 plates, with interleaved descriptions. Albany, 1876. 4to.
21. United States Geological Exploration of the Fortieth Parallel. Clarence King. Vol. IV. Ornithology and Palæontology; part II. Palæontology, James Hall and R. P. Whitfield; pages 199-302, 7 plates. Washington, 1877. 4to.
22. Palæontology of New York. Vol. V, pt. II, text pp. xv, 492, plates 120. Albany, 1879. 4to.

PART II.

SCIENTIFIC PAPERS PUBLISHED IN REPORTS, TRANSACTIONS OF SOCIETIES, JOURNALS, MAGAZINES, ETC.

N. B. — The title or an abstract only was given of papers in the list marked with an asterisk (*), as full notes were not furnished for publication.

1. Catalogue of Plants, Growing without Cultivation, in the Vicinity of Troy. John Wright and James Hall, 42 pages. Troy, 1836. 8vo.
2. Descriptions of two species of Trilobites, belonging to the genus PARADOXIDES. American Journal of Science and Arts. Vol. XXXIII, pp. 139-143. New Haven, 1837. 8vo.
3. Second Annual Report of the Fourth Geological District of New York. Assembly Doc. 200, pp. 287-373. Albany, 1838. 8vo.
4. Third Annual Report of the Fourth Geological District of the State of New York. Assembly Doc. 275, pp. 287-339. Albany, 1839. 8vo.
5. Fourth Annual Report of the Survey of the Fourth Geological District. Assembly Doc. 50, pp. 389-456. Albany, 1840. 8vo.
6. Fifth Annual Report of the Fourth Geological District. Assembly Doc. 150, pp. 149-180. Albany, 1841. 8vo.
7. Notes explanatory of a section from Cleveland, Ohio, to the Mississippi river, in a south-west direction, with remarks upon the Identity of the Western Formations with those of New York. Transactions of the Association of American Geologists and Naturalists; pp. 267-293. Boston, 1842. 8vo.
8. Remarks upon Casts of Mud Furrows, Wave Lines, and other Markings upon Rocks of the New York System. Ibid., pp. 422-432.
9. Niagara Falls. Their physical changes and the Geology and Topography of the surrounding country. Boston Journal of Natural History. Vol. IV, pp. 106-134. Boston, 1842. 8vo.
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11. * Geographical Distribution of Fossils of the Palæozoic Strata of the United States. Proc. Am. Assoc. Geol. and Naturalists published in American Journal of Science and Arts. Vol. 45, pp. 157-160. New Haven, 1843. 8vo.

12. * Ripple Marks and Casts of Furrows. Ibid. Vol. 45, pp. 148-149. New Haven, 1843. 8vo.
13. * Sections at Portage. Ibid. Vol. 45, pp. 329-330. New Haven, 1843. 8vo.
14. Address before the Society of Natural History of the Auburn Theological Seminary, 1843; pp. 1-20. Auburn, 1844. 8vo.
15. * Geographical Distribution of Fossils. American Journal of Science, vol. 47, pp. 117-118. New Haven, 1844. 8vo.
16. Description of Some Microscopic Shells from the Decomposing Marl Slate of Cincinnati. Ibid. Vol. 48, pp. 292-295. New Haven, 1845. 8vo.
17. Notice of the Geological Position of the Cranium of the *Castoroides Ohioensis*. Boston Journal of Natural History, vol. V, pp. 385-391. Boston, 1846. 8vo.
18. * On the supposed impression in Shale of the soft parts of an *Orthoceras*. Quar. Journal, Geological Society, London, vol. V, pp. 107-111. London, 1848. 8vo.
19. On the Parallelism of the Palæozoic Deposits of North America, with those of Europe; followed by a table of the species of fossils common to the two continents, with indication of the positions in which they occur, and terminated by a critical examination of each of these species; by Ed. de Verneuil (translated and condensed from the Bulletin of the Geological Society of France, 2d Ser., vol. IV). Am. Jour. Science and Arts. 2d Ser., vol. V, pp. 176-183, 359-370. New Haven, 1848. 8vo. Ibid. 2d Ser., vol. VII, pp. 45-51, 218-231. New Haven, 1849. 8vo.
20. Remarks on the Observations of S. S. Haldeman "on the supposed identity of *Atops trilineatus* with *Triarthrus Beckii*." Am. Jour. Sci. and Arts, 2d Ser. vol. V, pp. 322-327. New Haven, 1848. 8vo.
21. Catalogue of Specimens in the Geological Department of the Geological Survey of New York. First Ann. Report on the State Cab. of Nat. Hist., 39 pages. Albany, 1848. 8vo.
22. Catalogue of specimens in the Palæontological Department of the Geological Survey of New York. Ibid., 15 pages.
23. * Upon some of the Results of the Palæontological Investigations in the State of New York. Am. Jour. Sci., 2d. Ser., vol. V, pp. 243-249. New Haven, 1848. 8vo.
24. List of Minerals, Geological Specimens and Fossils, added to the collections, 1847, 1848. Second Ann. Report of State Cab. of Nat. Hist.; 4 pages. Albany, 1849. 8vo.
25. On the Trails and Tracks in the Sandstones of the Clinton Group of New York; their probable origin, etc.; and a comparison of some of them with *Nereites* and *Myrianites*. Proc. Am. Ass. Ad. Sci., 2d meeting (Cambridge), 1849, pp. 256-260. Boston, 1850. 8vo.
26. On the Brachiopoda of the Silurian Period; particularly the *Leptænidæ*. Ibid., pp. 347-350.
27. On Graptolites, their Duration in Geological Periods, and their Value in the Identification of Strata. Ibid., pp. 351-352.
28. Description of New Species of Fossils, and Observations upon some other Species previously not well known, from the Trenton Limestone. Third Ann. Report State Cab. Nat. Hist., pp. 167-175, 5 plates. Albany, 1850. 8vo.

29. * Remarks on the Geology of Mackinac, Drummond and St. Joseph's Islands and the Northern Shores of Lake Michigan. Proc. Am. Assoc. Ad. Sci., 4th meeting (New Haven), 1850, p. 354. Washington, 1851. 8vo.
30. * Report on the Invertebrate Fossils exhibited to the Association. Proc. Am. Assoc. Ad. Sci., 5th meeting (Cincinnati), 1851, p. 180. Washington, 1851. 8vo.
31. * Parallelism of the Palæozoic Rocks of New York, with those of the Western States, and of all those with the Palæozoic Strata of Europe. Ibid., p. 59.
32. * On the Silurian Rocks of the Lake Superior Land District. Ibid., pp. 64-66.
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PLATE I.

PLANORBIS EXACUTUS.

Page 51.

Figs. 1, 2. Side views of two specimens, showing the position and form of the aperture, $\times 9$.

Fig. 3. A sinistral example, retaining but few of the characters pertaining to the species, $\times 9$. *Swamp, Greenbush, N. Y.*

SOMATOGYRUS SUBGLOBOSUS.

Page 52.

Fig. 4. A shell presenting a carination around the upper portion of the volutions, and a narrow and angular aperture, $\times 3$.

Mohawk river.

GILLIA ALTILIS.

Page 51.

Fig. 5. View of a biflexed specimen in which the three apical volutions are dextral and the fourth or outer volution is sinistral, $\times 9$.

Hudson river, Albany, N. Y.

PHYSA ANCILLARIA.

Page 50.

Fig. 6. A specimen with an expanded aperture.

Fig. 7. An example in which the outer volution shows a tendency to uncoil, and the aperture to become circular.

Fig. 8. A deformed shell presenting a very deep sinus in the lower part of the aperture. All natural size. *Hudson river, Albany, N. Y.*

VALVATA TRICARINATA.

Page 51.

Fig. 9. A specimen with the volutions unrolled except at the apex, $\times 9$.

Island creek, Albany, N. Y.

UNIO PRESSUS.

Page 52.

Fig. 10. A left valve, showing an unusually alated cardinal extremity, and absence of radiating bands on the outer great zone of growth.

Fig. 11. A small right valve of a specimen, showing two broad radiating undulations. The shell is also higher than normal forms.

Fig. 12. Left valve with the anterior portion narrow and auriculate, umbo oblique, and the wing much reduced. Natural size.

Normanskill.

UNIO CARIOSUS.

Page 52.

Fig. 13. A very gibbous left valve, narrowed in front and flattened on the ventral margins. Female; natural size.

Hudson river, Albany, N. Y.

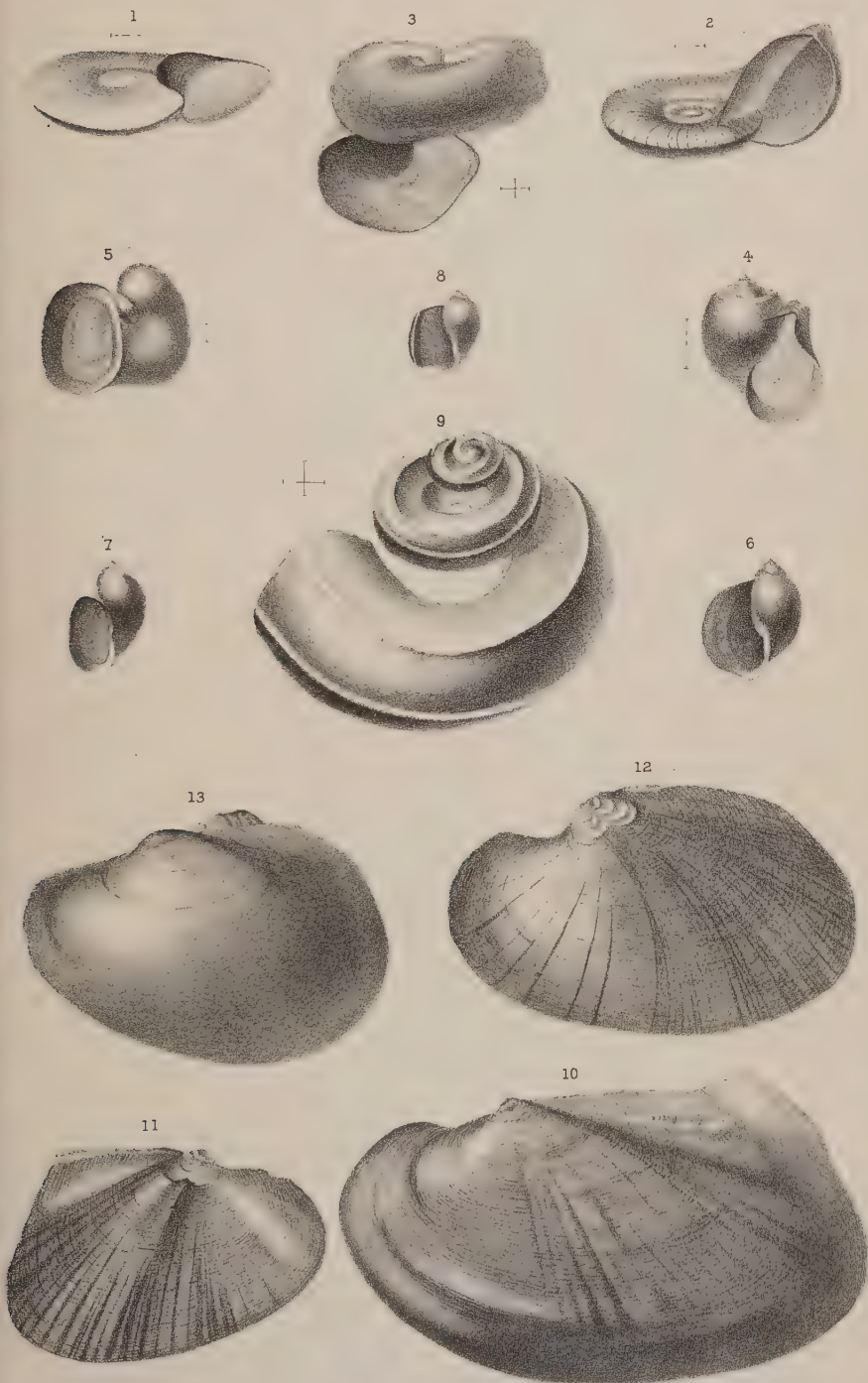


PLATE II.

UNIO NASUTUS.

Page 52.

Fig. 1. Left valve of a female, showing plications of the shell produced by growth over the gills while distended with fry. Natural size.

Canal, West Troy, N. Y.

UNIO COMPLANATUS.

Page 53.

Fig. 2. A specimen presenting characters similar to the preceding, but showing two or more successive periods of impregnation. The general form of the shell is normal and may serve for comparison with the three following illustrations of unusual examples.

Canal, West Troy, N. Y.

Fig. 3. A right valve having the umbo nearly central and with a strong sulcus on the anterior portion of the valve.

Canal, West Troy, N. Y.

Fig. 4. A very elongate cylindrical form.

Fig. 5. *Id.* Posterior view, showing the convexity of the valves.

Hudson river, Albany, N. Y.

Fig. 6. A wide, regularly elliptical specimen with large, prominent, rounded umbo which is situated just anterior to the middle of the cardinal line. Natural size.

Canal, West Troy, N. Y.

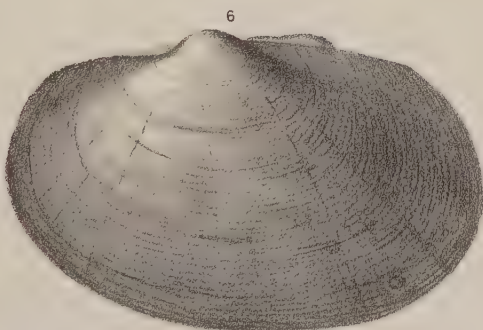
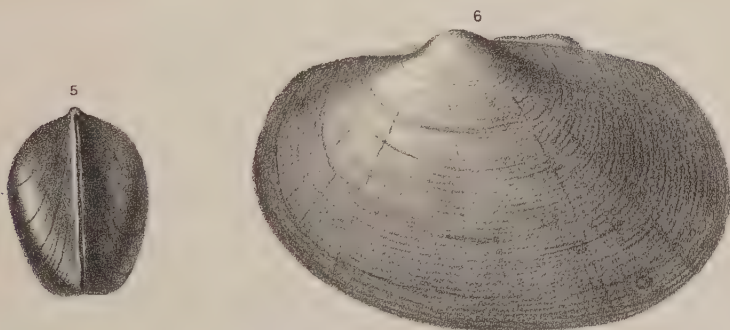
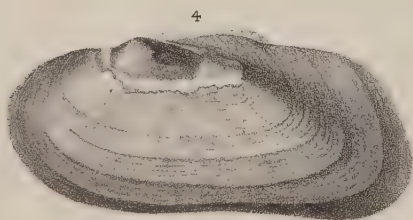
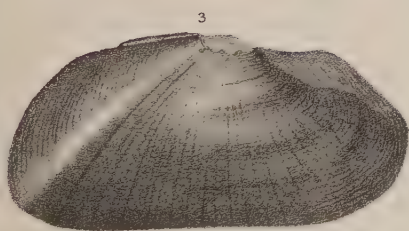
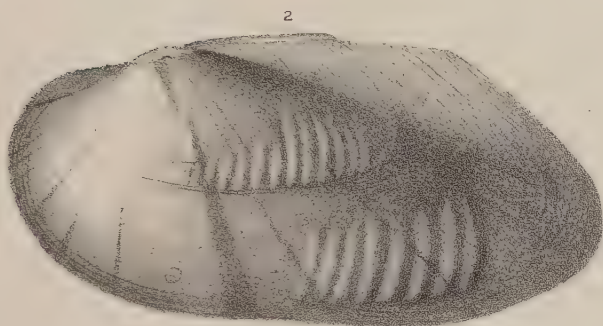
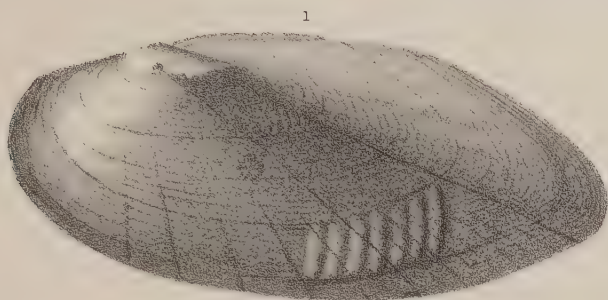


PLATE III.

PLATYSTROPHIA TRICENARIA.

Page 73.

Fig. 1. Horizontal section of a portion, including two of the radii, and showing the fibrous non-punctate character of the shell.

PLATYSTROPHIA BIFORATA.

Page 73.

Fig. 2. Showing the fibrous structure of the shell.

PLATYSTROPHIA OCCIDENTALIS.

Page 73.

Fig. 3. Similar to the preceding.

PLATYSTROPHIA SUBQUADRATA.

Page 73.

Fig. 4. Section showing the fibrous structure of the shell, and the large scattered punctæ.

PLATYSTROPHIA FLABELLA.

Page 73.

Fig. 5. A section including two of the interradii areas. The lower right hand portion has been cut through to the surface of the shell and shows the concentric striæ.

ORTHIS PERVETA.

Page 73.

Fig. 6. Section showing the rows of minute punctæ.

ORTHIS CLYTIE.

Page 73.

Fig. 7. Showing the single and double rows of punctæ between the fibrous interspaces.

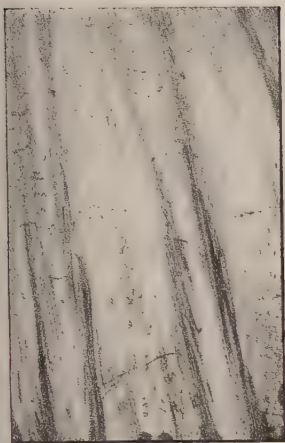
ORTHIS ELEGANTULA.

Page 73.

Fig. 8. Showing somewhat obscurely the broad rows of punctæ.

Fig. 9. Horizontal section of the shell through a varix of growth; the punctæ are partially obliterated by the action of the crystallization of iron pyrite.

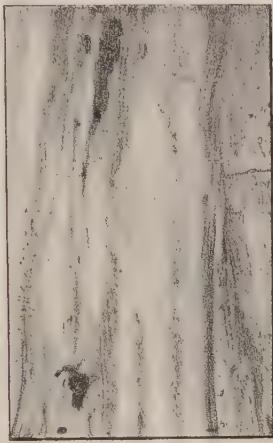
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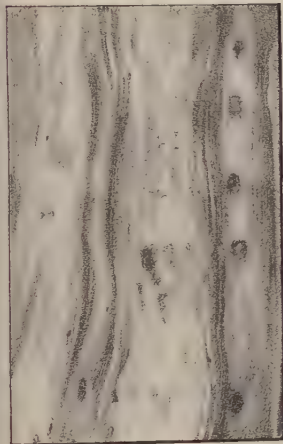
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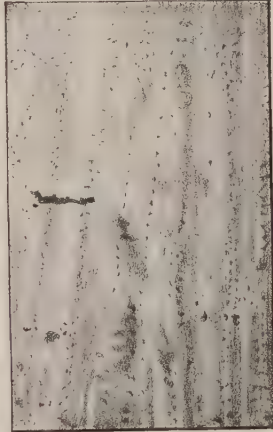
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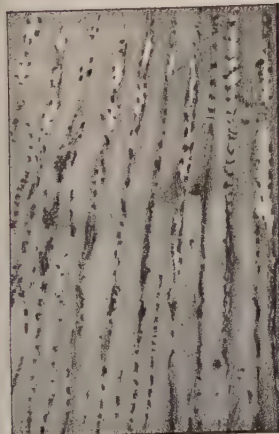
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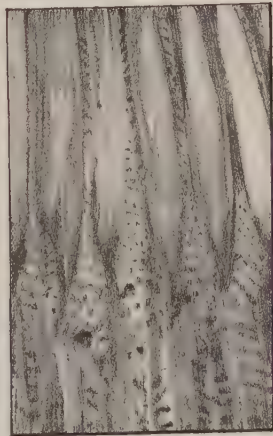


PLATE IV.

ORTHIS VANUXEMI.

Page 73.

- Fig. 1. Vertical longitudinal section through a portion of the test, showing the laminæ of the shell and tubuli. Some of the tubuli bifurcate before reaching the surface.
- Fig. 2. Vertical longitudinal section through the front of two valves, showing very distinctly the oblique laminæ and the size of the vertical tubuli.
- Fig. 3. Horizontal section from near the surface, showing large and small punctæ.
- Fig. 4. Section from near the center of a valve, showing the fibrous and punctate structure.
- Fig. 5. Section at some depth below the surface, showing the regular rows of punctæ and flexuous direction of the fibres which run independently of the rows of punctæ.

ORTHIS PENELOPE.

Page 73.

- Fig. 6. Horizontal section showing the very strongly marked rows of punctæ and intermediate fibrous structure.

SCHIZOPHORIA MULTISTRIATA.

Page 73.

- Fig. 7. Showing the numerous minute punctæ and fibrous structure of the shell of this species.

SCHIZOPHORIA IOWENSIS.

Page 73.

- Fig. 8. A section from near the surface, showing the numerous punctæ. In sections cut at a greater depth the appearance is similar in general features to fig. 9. "

SCHIZOPHORIA TULLIENSIS.

Page 73.

- Fig. 9. Showing the numerous close punctæ with no definite arrangement.

SCHIZOPHORIA IMPRESSA.

Page 73.

- Fig. 10. Section from nearer the surface than the preceding, showing the broad bands of punctæ which gradually coalesce and produce an evenly punctate structure.

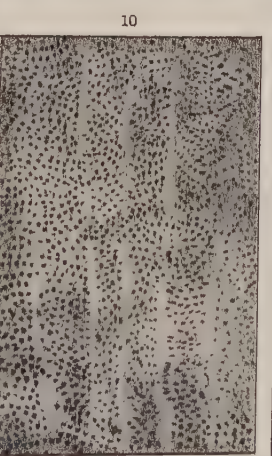
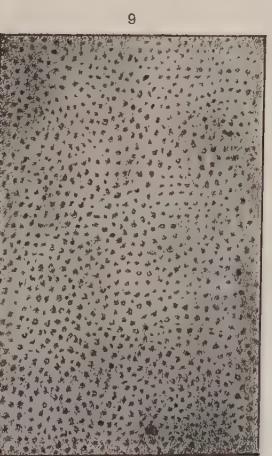
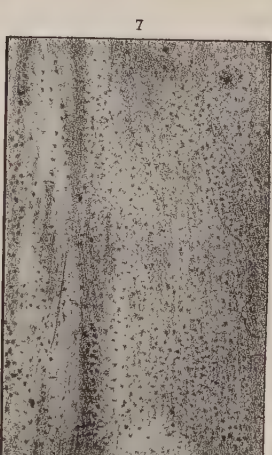
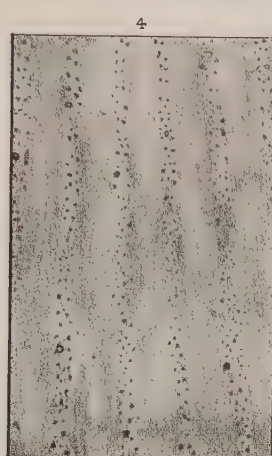
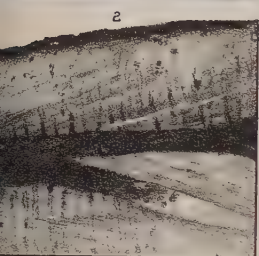
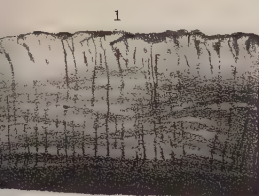


PLATE V.

STYLONURUS EXCELSIOR.

Page 75.

View of the carapace described. The figure was drawn from a plaster cast taken from the matrix, as this portion preserved the markings of the test in a greater degree of perfection than the reverse or relief.

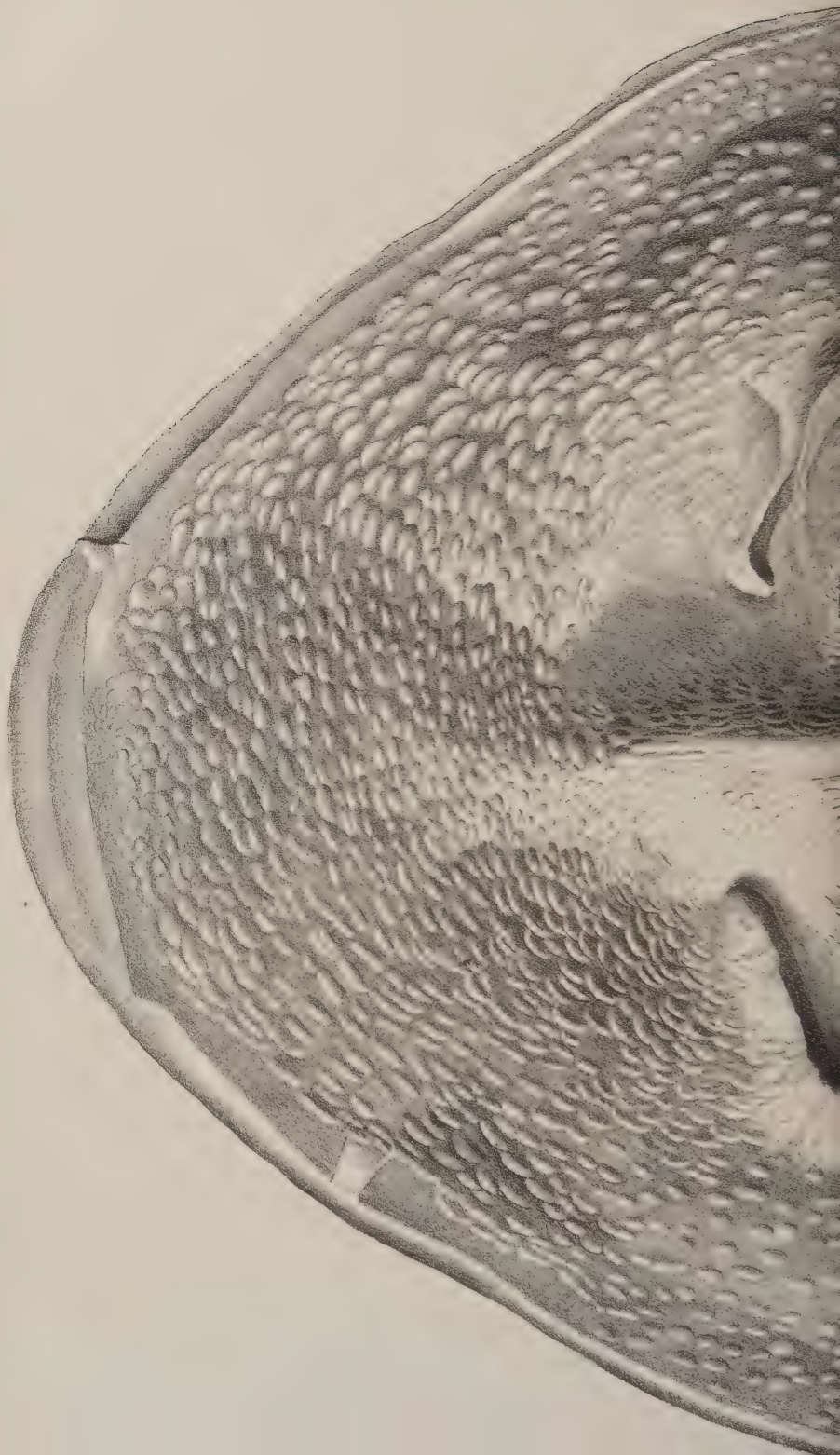




PLATE VI.

CRYPTOZOÖN, *N. G.*

In the town of Greenfield, Saratoga county, there occurs a bed of limestone which presents a very remarkable appearance, the surface being nearly covered by closely-arranged circular or subcircular discs which are made up of concentric laminae, closely resembling in general aspect the structure of *Stromatopora*. It very often happens that within these larger discs there occur two or more smaller ones, each with its own concentric structure and exterior limitation, and appearing as if budding from the parent mass. A farther examination shows that the entire form of these masses is hemispheric or turbinate, with the broadest face exposed upon the upper surface of the limestone layer; that their growth has begun from a point below and rapidly expanding upwards, has often extended one or two feet in diameter, as now shown upon the exposed surface of the limestone bed. At a single exposure on the farm of Mr. Hoyt, the surface of the limestone is covered by these bodies for many rods in extent. The entire area of the cellar beneath the house of Mr. Hoyt is upon this bed of limestone closely covered by these hemispheric masses with concentric structure. For a distance of one or two miles to the southward the outcrop of this limestone can be traced, and everywhere presenting the same characters in the presence of these masses. Large numbers of specimens of various sizes have been weathered out and lie scattered over the surface. This fossil has also been found at Little Falls, Herkimer county, N. Y.

These bodies have long been known under the name of *Stromatopora*, from their general resemblance in form and structure to that fossil; but their position in reference to the bedding of the rock is uniformly the reverse of that of *Stromatopora*, which occur in the higher limestones, growing from a broad base which is covered by an epitheca, while these bodies under consideration grow upward and expand from a point below, while the convex surface is on the lower side. A careful examination of the nature of these bodies proves that while having the concentric structure common to *Stromatopora* they have not the regular succession of layers of tubuli characteristic of the species of that genus and cannot properly be included under that term. I, therefore, propose the term *Cryptozoön* as a designation for this peculiar form and mode of growth which will be more fully elucidated in the future.

CRYPTOZOÖN PROLIFERUM, *n. sp.*

These bodies are made up of irregular, concentric laminae of greater or less density and of very unequal thickness. The substance between the concentric lines, in well-preserved specimens, is traversed by numerous, minute, irregular canaliculi which branch and anastomose without regularity. The central portion of the masses are usually filled with crystalline, granular and oölitic material and many specimens show the intrusion of these extraneous and inorganic substances between the concentric laminae. That these are intrusions, and not inclusions, is shown from the fact that they can be traced to a vertical fissure or break leading to the exterior of the fossil and which allowed the crystalline matter to enter.





